CONTRACT NAS5-32605
EOSDIS IV&V

INTEGRATED SUPPORT ENVIRONMENT (ISE) ELEMENT SOFTWARE DESIGN

(DRAFT - Deliverable 0409)

July 14, 1995

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1. INTRODUCTION

1.1. Identification of Document

This is the Element Software Design Document for the Integrated Support Environment (ISE). The ISE is being established under the IV&V Infrastructure and Tools task (Task 4B) and will provide the tools and infrastructure necessary for the performance of the Earth Observing System Data and Information System (EOSDIS) Independent Verification and Validation (IV&V) contract.

1.2. Purpose and Scope of Document

The ISE is primarily comprised of Commercial Off-The-Shelf (COTS) products. However, the establishment of the ISE will also include developed tools and customizations of off-the-shelf Lotus Notes database applications. This document identifies the software design associated with tools which are being developed for incorporation into the ISE. The high level design information captured within this document provides the information necessary to maintain developed items for the duration of the EOSDIS IV&V contract.

1.3. Document Status and Schedule

This is the initial DRAFT of the ISE Element Software Design Document. The first official revision of the document is scheduled for delivery on 15 December 1995. This DRAFT release of the design document includes preliminary design information for the following ISE development items:

1. Automated Requirements Database (ARDB)
2. Interface Analysis Database (IADB)
3. Data Browser Interface (DBI)

The first official revision of the ISE Software Design Document will document the software design for one additional ISE development item. The software design for the Test Management Database (TMDB) application has not been included in this DRAFT release of the document since analysis activities have not been completed. Following the release of the first official design document revision in December 1995, this document will be updated as necessary to accurately reflect the design of ISE development items. The initial release of the ISE will be fielded in February 1996 and will evolve as additional IV&V needs are defined during the span of the ten year project.

1.4. Documentation Overview and Organization

This document presents software design information which is being maintained for ISE development items. At a minimum, the design information maintained includes the anticipated Graphical User Interface (GUI) and the data storage structure (file structure, file hierarchy, database schema, etc.). In addition to the design information, this document contains an overview of the design approach, some general information on the types of applications being developed, and a brief description of the development tools and environment.

Since this document only addresses those elements of the ISE which are associated with new development, a complete understanding of the ISE can not be garnered from the review of this document. Refer to the ISE System Requirements Document or the ISE System Architecture Document to obtain a more complete understanding of the functionality to be exhibited by the ISE infrastructure.

Section 1 establishes the context of the document through an ***introduction***. This identifies the document, the scope and purpose of the document, and the status of the document.

Section 2 lists the ***related documentation*** including parent documents and applicable documents.

Section 3 describes the ***design approach and tradeoffs***. This section provides an overview of development initiatives, development tools, and the rapid prototyping approach that was employed.

Section 4 details the ***design information*** associated with ISE development items.

Section 5 is the ***external interface design*** information pertinent to ISE development items.

Section 6 contains a list of ***abbreviations and acronyms*** used in this document.

Section 7 contains a ***glossary*** of terms used in this document.

Section 8 contains ***notes*** pertaining to material in this document.

Section 9 identifies the ***appendices*** included in this document.

2. RELATED DOCUMENTATION

2.1. Parent Documents

The following documents are parents to this document:

1. "Earth Observing System (EOS) Performance Assurance Requirements (PAR) for the Independent Verification and Validation (IV&V) of the EOS Data and Information System (EOSDIS)", GSFC 420-05-05, dated March 23, 1993.
2. "Statement of Work for the Independent Verification and Validation (IV&V) of the EOS Data and Information System and Key EOS Ground System Interfaces", dated April 19, 1993.
3. "EOSDIS IV&V Task 4 IV&V Infrastructure and Tool Development Task Statement of Work", dated 19 October 1994.
4. "EOSDIS IV&V Task 4B IV&V Infrastructure and Tool Development Task Statement of Work", dated 19 June 1995.

2.2. Applicable Documents

The following documents are referenced herein and are directly applicable to this volume:

1. ISE System Requirements Document (Deliverable 0404) dated 28 October 1994.
2. ISE System Architecture Document (Deliverable 0405) dated 30 January 1995.
3. ISE Element Requirements Document (Deliverable 0408) dated 14 April 1995.
4. "NASA Software Documentation Standard Software Engineering Program" NASA-STD-2100-91, dated July 29, 1991

3. DESIGN APPROACH AND TRADEOFFS

3.1. Rapid Prototyping Approach

In the rapid prototyping approach, the most important and critical software requirements are defined to the extent that current knowledge and experience permits the incremental capabilities required. After a core set of requirements are documented for an incremental capability, a "quick" object oriented design addressing the current set of requirements is prepared, and a rapid prototype is developed and tested. The purpose of the prototype is to gain information about the requirements and confidence in the correctness of the prototype design. Design characteristics such as efficiency, maintainability, capacity, and adaptability are also considered in the prototype since the intent is to extend the prototype to fulfill capabilities required by the system. The developed prototype is evaluated by the end user to accumulate comments that result in the refinement of the documented requirements, design, and the prototype itself. This rapid prototyping approach is iterative and is repeated for each incremental tool capability.

3.2. ISE Development Infrastructure

The ISE system architecture reflects a networked heterogeneous environment incorporating several COTS products and a few developed or customized applications. The planned ISE architecture has been detailed in the ISE System Architecture Document dated 30 January 1995. The documented architecture depicts an environment which is flexible and supportive for incrementally adding tools as new needs and requirements are levied against the ISE. Exhibit 3.1-1 reflects the network/computational infrastructure of the ISE. Note that the infrastructure depicted also serves as the computational infrastructure necessary to support ISE development.

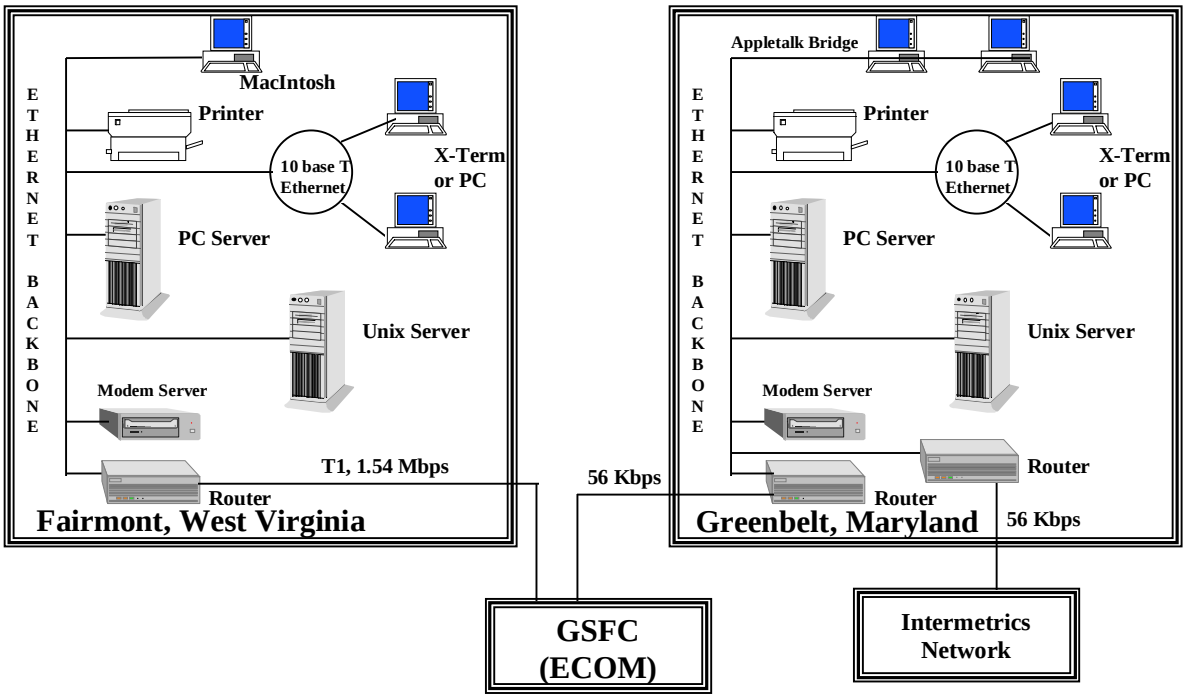

Exhibit 3.1-1 Network/Computational Infrastructure

In addition to the network/computational infrastructure, a high level understanding of the development infrastructure can be garnered from Exhibit 3.1-2, ISE Development Infrastructure. This exhibit depicts many of the COTS tools which are a part of the ISE as well as the tools necessary to satisfy tool development undertakings.

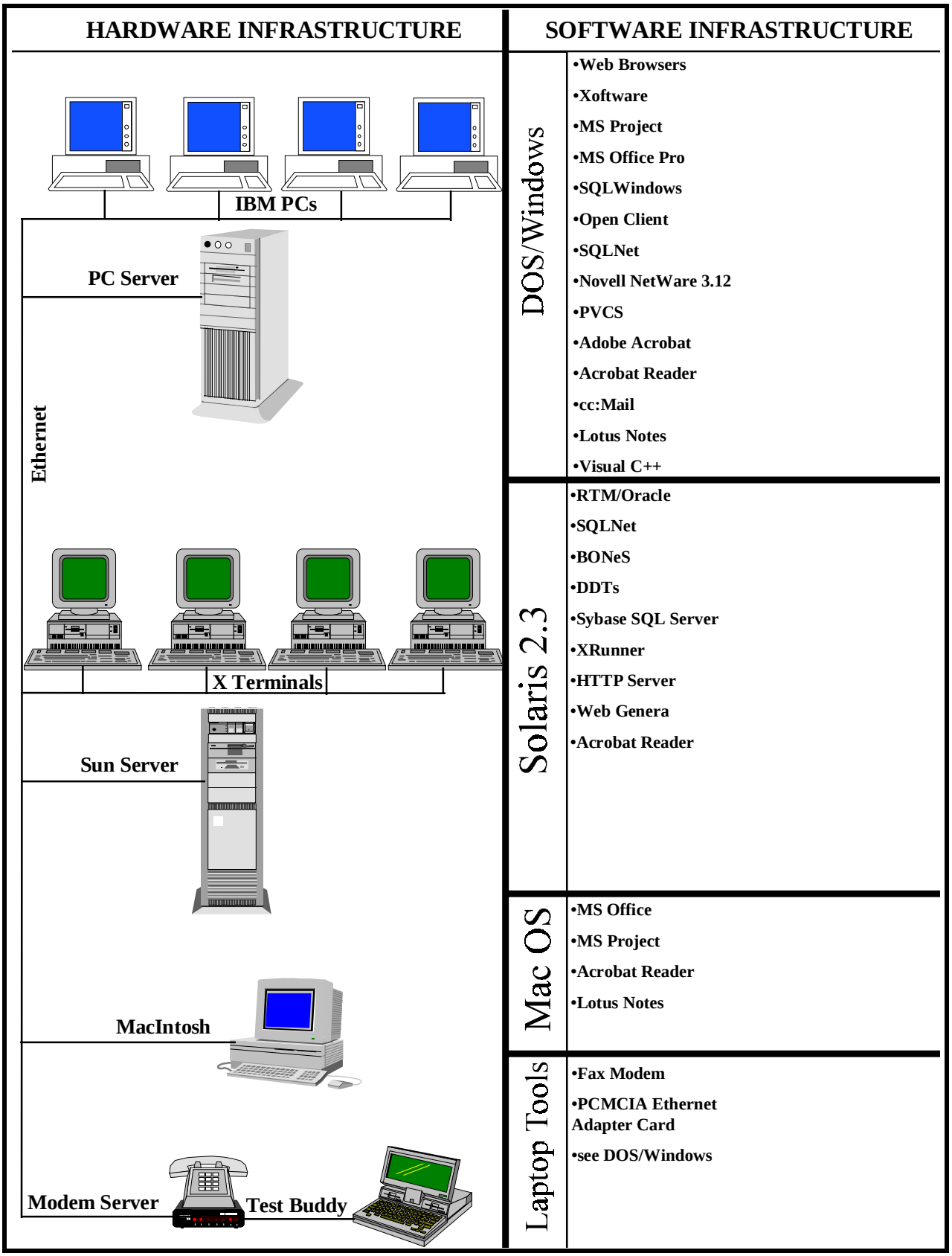

Exhibit 3.1-2 ISE Development Infrastructure

For additional information concerning the ISE network/computational infrastructure and ISE Toolbox tools, refer to sections 5.2.1 and 5.2.2 of the ISE System Architecture Document dated 30 January 1995.

3.3. Tool Development Overview

Based upon identified EOSDIS IV&V tool needs, development activities have been initiated where no COTS solution exists that satisfies levied requirements. These development initiatives are limited to database and homepage applications. These types of applications yield benefits that enhance communications, automate labor intensive processing, provide support for working at geographically dispersed sites, and promote sharing of information. As a result of these benefits, IV&V activities yield higher quality products in a more timely and efficient manner.

3.3.1. Client/Server Development

The development of three client/server applications are targeted to support existing EOSDIS IV&V activities. These applications include:

- the Automated Requirements Database (ARDB),
- the Interface Analysis Database (IADB), and
- the Test Management Database (TMDB).

Refer to section 4 of this document for detailed descriptions of these applications and the associated design information. These applications are being developed using the Gupta SQLWindows client/server development tool. SQLWindows is a Rapid Application Development (RAD) tool which allows for rapid prototyping of the graphical user interface using a gui builder. Once the interface is constructed, functionality is provided to associate database data from any number of COTS database management systems with the painted interfaces. Application code is then generated by SQLWindows to build the client/server application which can be deployed at various remote sites on as many PCs as desired without run-time fees. All applications read data from the RTM/Oracle database and store application data in a SYBASE SQL Server database. The server databases will reside at the location where the majority of access is expected so that client/server application performance is maximized. During development, the prototype applications will communicate with databases located at the NASA/WVU Software IV&V Facility located in Fairmont, WV.

Since the applications are actually built by the SQLWindows code generator, many aspects detailed by the NASA-STD-2100 design document Data Item Description (DID) are not applicable. For this tooling effort, it was determined that the Graphical User Interface (GUI) and database schema design information should be captured in support of anticipated Maintenance and Operations (M&O) activities.

3.3.2. World Wide Web Page Development

In addition to disseminating EOSDIS IV&V information to external ISE users via the targeted client/server applications, EOSDIS IV&V deliverables are made available for review via the EOSDIS IV&V Homepage. The EOSDIS IV&V Homepage provides hotlinks to other EOS and NASA related pages, includes EOSDIS IV&V contact information, allows access to EOSDIS IV&V deliverables in several formats, and makes various Interface Analysis Database (IADB) reports accessible to the external user community. Technologies associated with publishing World Wide Web (WWW) pages were employed including Hyper Text Markup Language (HTML), Common Gateway Interface (CGI) logic, and machine executable scripts.

3.3.3. Lotus Notes Development

Lotus Notes is a groupware product that promotes dissemination of information in a team environment. Several database applications come with the COTS product and provide foundations for customization and tailoring. In addition to using precanned or customized applications, two Lotus Notes applications were developed and fielded for use on the EOSDIS IV&V contract during Milestone 1 (first contract year) activities. These applications include the Data Management Database (DMDB) and the Issue/Discrepancy Handling System (IDHS). The DMDB provides support for managing Government Furnished Equipment (GFE), inclusive of hardware and software. The IDHS supports the management of IV&V issues and IV&V submitted Review Item Discrepancies (RIDs). Since these applications were developed under Milestone 1 activities, the design and user's guide information is electronically maintained as a part of the applications via HELP screens. No additional design information is detailed within this document.

4. DESIGN DESCRIPTION

4.1. Automated Requirement Database (ARDB) Design

The Automated Requirements database is designed to support the monitoring and requirements management during the development of the EOS Ground System (EOS GS). The purpose of this tool is to facilitate a systematic requirements analysis of the requirement documents produced by the various organizations and supporting contractors. It also defines the links between the requirements and specific integration, verification, and validation tests which will be performed. The ARDB collects the results of requirements evaluation in terms of a numerical rating and the engineering rationale that substantiates the rating. The ARDB assists analysts in browsing requirements, reviewing evaluation criteria, assessing the traceability analysis, recording evaluations, identifying requirements with high ratings, and generating reports on the analysis.

4.1.1. ARDB GUI Design

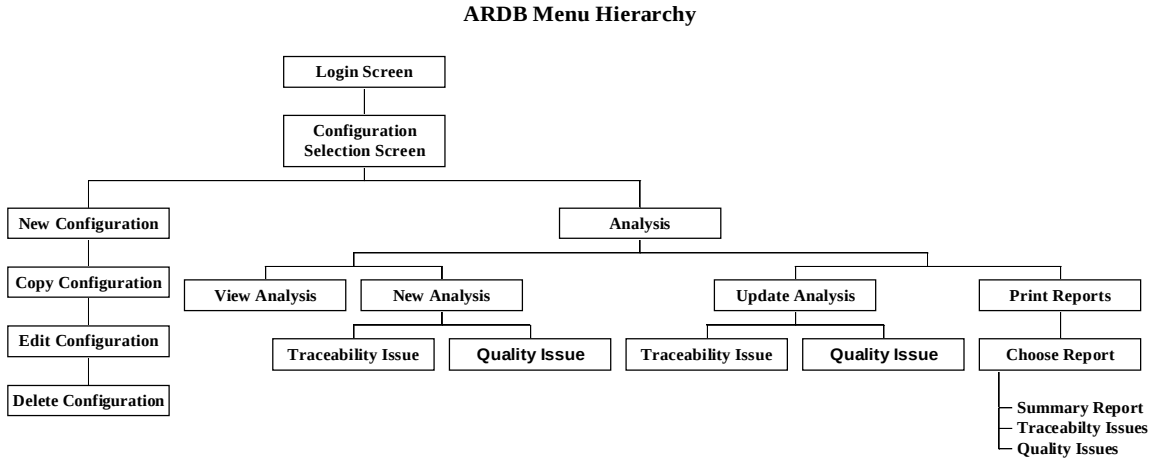

Exhibit 4.1.1-1 ARDB Menu Hierarchy

Exhibit 4.1.1-1 represents the hierarchy of menu choices presented in using the ARDB. The following subsections detail the user interface design for the ARDB.

4.1.1.1. ARDB Login Screen

The ISE ARDB Login screen controls access to the tool by requiring a user to enter a name and a password. The user name is captured and stored in the data base with the results of the requirement analysis.

FIELDS:

1. Login Name
   The Login Name text field accepts users login name. A list of user names is stored in the **analysts** table under SYBASE.

2. Password
   The Password text field accepts a user defined password. Passwords are stored in the **analysts** table under SYBASE.
   .

BUTTONS:

1. Login
   Checks the **analysts** table to see if the user is valid and invokes the Configuration Selection screen.
2. Cancel
   Exits the ARDB tool.

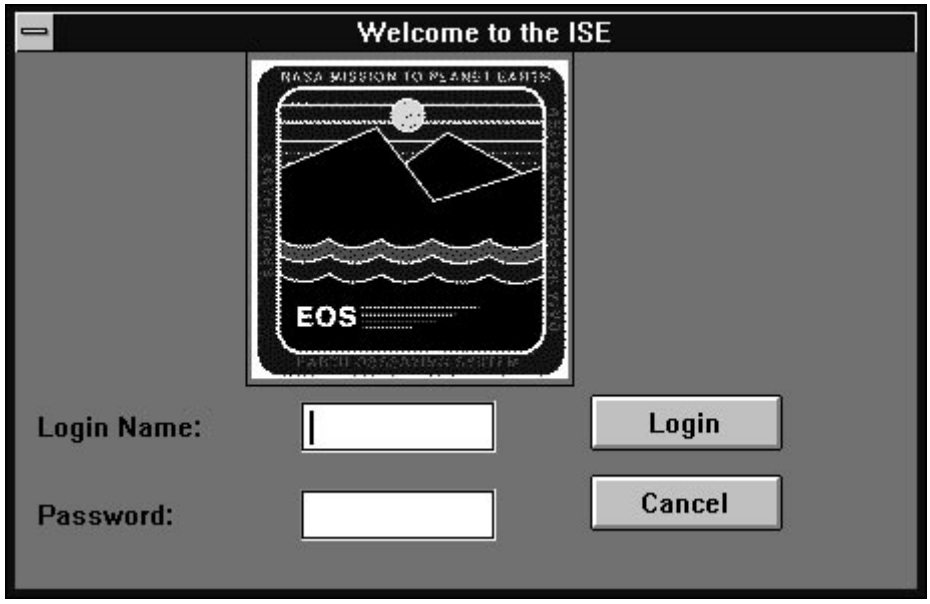

Exhibit 4.1.1-2 ARDB Login Screen

4.1.1.2. ARDB Configuration Selection Screen

The Configuration Selection Screen enables users to select a previously defined requirements analysis configuration. A configuration consists of a particular set of requirements under analysis. Configurations are categorized in terms of RTM class, System, Release, RTM file date, a unique Configuration ID, date of configuration creation, and a brief description. If the user chooses to produce a new configuration the New button is selected and the New Configuration Screen would appear. Configurations may also be copied, deleted, or edited by pressing the corresponding button. The user may begin the analysis process by pressing the analysis button to open the Select Requirement Screen.

FIELDS:

1. Configuration ID
   The Configuration ID text field displays a key created by the analyst to distinguish the requirements analysis effort currently being completed.
2. Configuration Description
   The Configuration Description text field displays a brief description of the configuration.

The Configuration ID and Description are stored in a SYBASE table called CONFIG.

MENU ITEMS:

1. Exit
   Close the window and exit the ARDB application.
2. Configuration
   Same selections as the screen buttons (New, Edit, etc.)
3. Maintenance
   This menu item invokes the maintenance screen. The maintenance screen is used by personnel with a supervisory level of access to control choices available through combo boxes on the analysis entry screens and to add RTM version dates to the menu choices when new dumps of the RTM data become available.

BUTTONS:

1. New
   Produce a new Configuration (see section 4.1.1.3 ARDB New Configuration Screen)
2. Edit
   Modify an existing Configuration
3. Copy
   Produce a copy of an existing Configuration
4. Delete
   Delete a Configuration
5. Analysis
   Start analysis on the requirements in the highlighted Configuration (see section 4.1.2 ARDB Analysis Requirement Selection
6. Exit
   Close the window and exit the ARDB application.

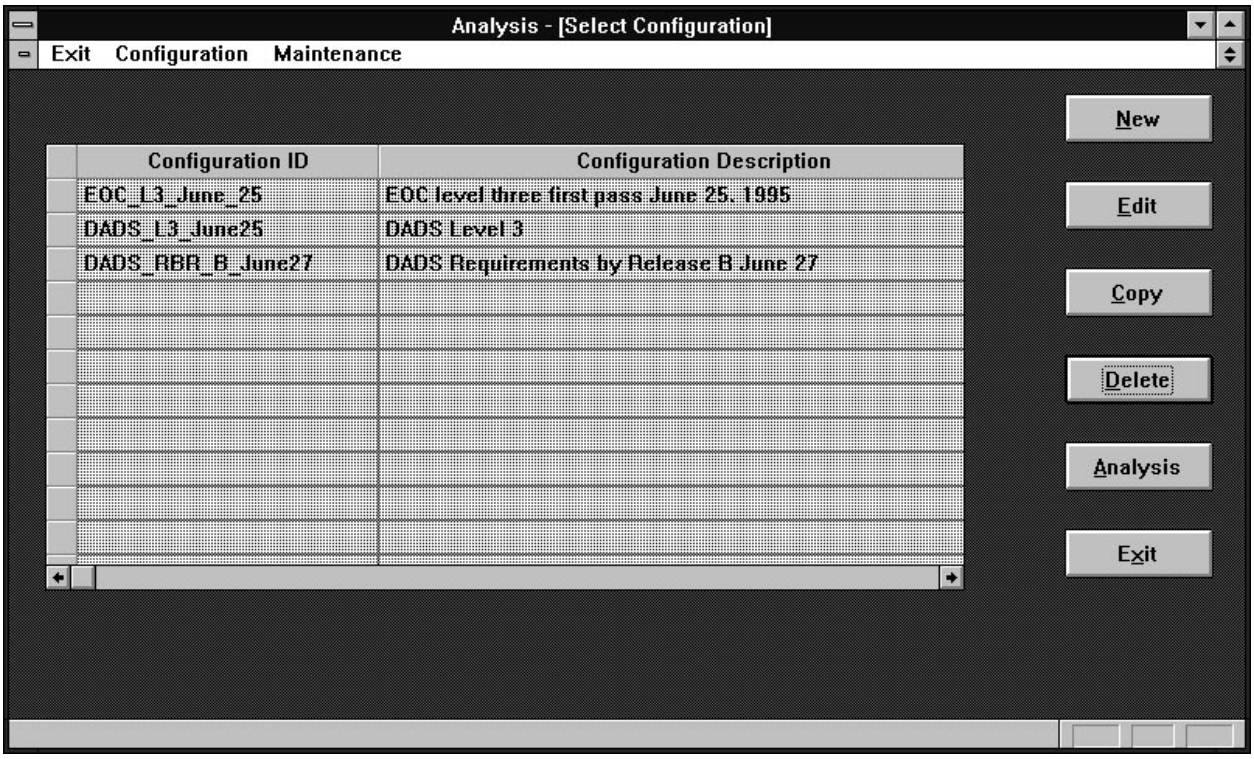

Exhibit 4.1.1-3 ARDB Configuration Selection Screen

4.1.1.3. ARDB New Configuration Screen

The New Configuration Screen permits users to outline a new set of requirements or define a new area of analysis by setting the limits of a set of requirements. The Configuration ID and the Configuration Description are defined by the user. These fields allow the user to resume the analysis at a later date if not completed and allow multiple analysts to work on the same set of requirements. The System, RTM Class, and Release are part of the selection criteria and are pulled from the RTM database. They are used in querying the RTM database for existing requirements that are needed for analysis. The RTM File Date allows the user to select which version of the requirements from Hughes are to be analyzed. The RTM File Date information is maintained by administrative personnel.

FIELDS:

1. System
   The System combo box pulls down to display a list of the ECS systems. The user selects one of these or the asterisk (all) as one element in defining an analysis configuration.
2. RTM Class
   The RTM Class combo box pulls down to a list of the RTM classes (levels) of requirements. The user selects one of these as one element in defining an analysis configuration.

3. Release
   The Release combo box pulls down to display a list of releases. This box is active only if the class Requirements by Release is selected in RTM Class.
4. RTM File Date
   The RTM File Date combo box pulls down to display a list of available versions of the RTM/Oracle data.
5. Configuration ID
   The Configuration ID text field permits users to enter a unique string identifying the configuration.
6. Configuration Description
   The Configuration Description multi-line field permits users to enter a brief description of the configuration.
7. Requirement ID
   The Requirement ID text column of the table displays a list of the requirement identification number (PARAGRAPH_ID in RTM) for all the requirements in the configuration..
8. Requirement Text
   The Requirement Text column of the table displays a list of the actual wordings of the requirements as stored in RTM/Oracle.

BUTTONS:

1. Populate Table
   The Populate Table button queries the RTM/Oracle database with the criteria selected and displays the results in the table for viewing.
2. Save
   Saves the configuration in the **config** table.
3. Exit
   Closes the window and returns to the Select Configuration Screen.

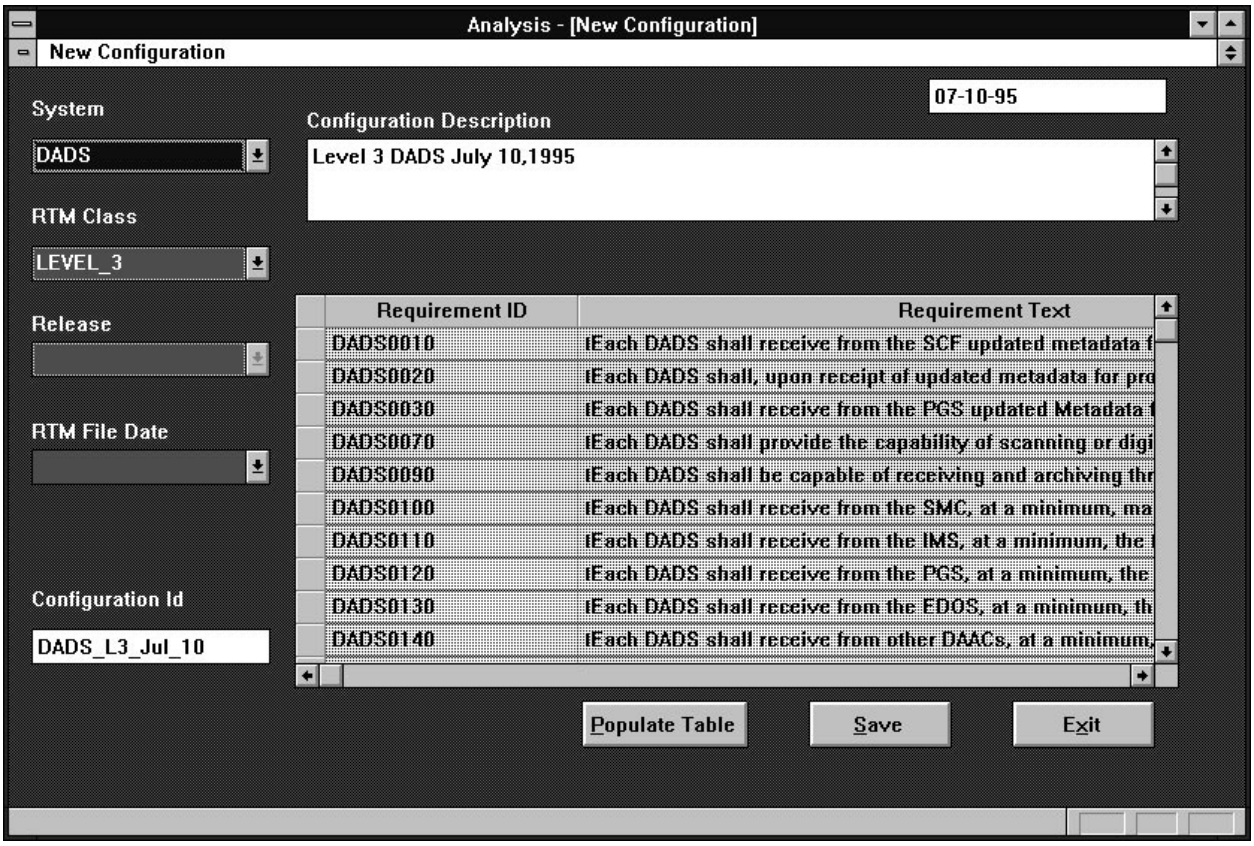

Exhibit 4.1.1-4 ARDB New Configuration Screen

4.1.1.4. ARDB Analysis Requirement Selection Screen

The Analysis Requirement Selection Screen enables the user to select a particular requirement, from the current configuration, for analysis.

FIELDS:

1. System
   The System text field displays the system associated with the current configuration.
2. RTM Class
   The RTM Class text field displays the RTM class associated with the current configuration.
3. Release
   The Release text field displays the Release associated with the current configuration.
4. Configuration
   The Configuration text field displays the configuration identifier text string.
5. Requirement ID
   The Requirement ID text column of the table displays the requirement identification number (PARAGRAPH_ID in RTM).
6. Requirement Text

The Requirement Text column in the table displays the actual wording of the requirement as stored in RTM/Oracle.

The category fields are populated from the **config** table in the SYBASE database. The table fields are populated from the RTM/Oracle database.

BUTTONS:

1. NEW
   The NEW button invokes the Requirement Analysis screen to begin the analysis of the highlighted requirement. If an analysis has already been started the user will be prompted to use UPDATE.
2. VIEW
   The VIEW button invokes a view window that is identical to the Requirement Analysis screen but operates in a read-only mode.
3. UPDATE
   The UPDATE button invokes the Update Requirement Analysis screen that is identical to the Requirement Analysis screen but permits the modification of existing analysis data.
4. Exit
   The Exit button closes this window.
5. Print Reports
   The Print Reports button invokes a dialog box that prompts the user for the type of report to be produced.

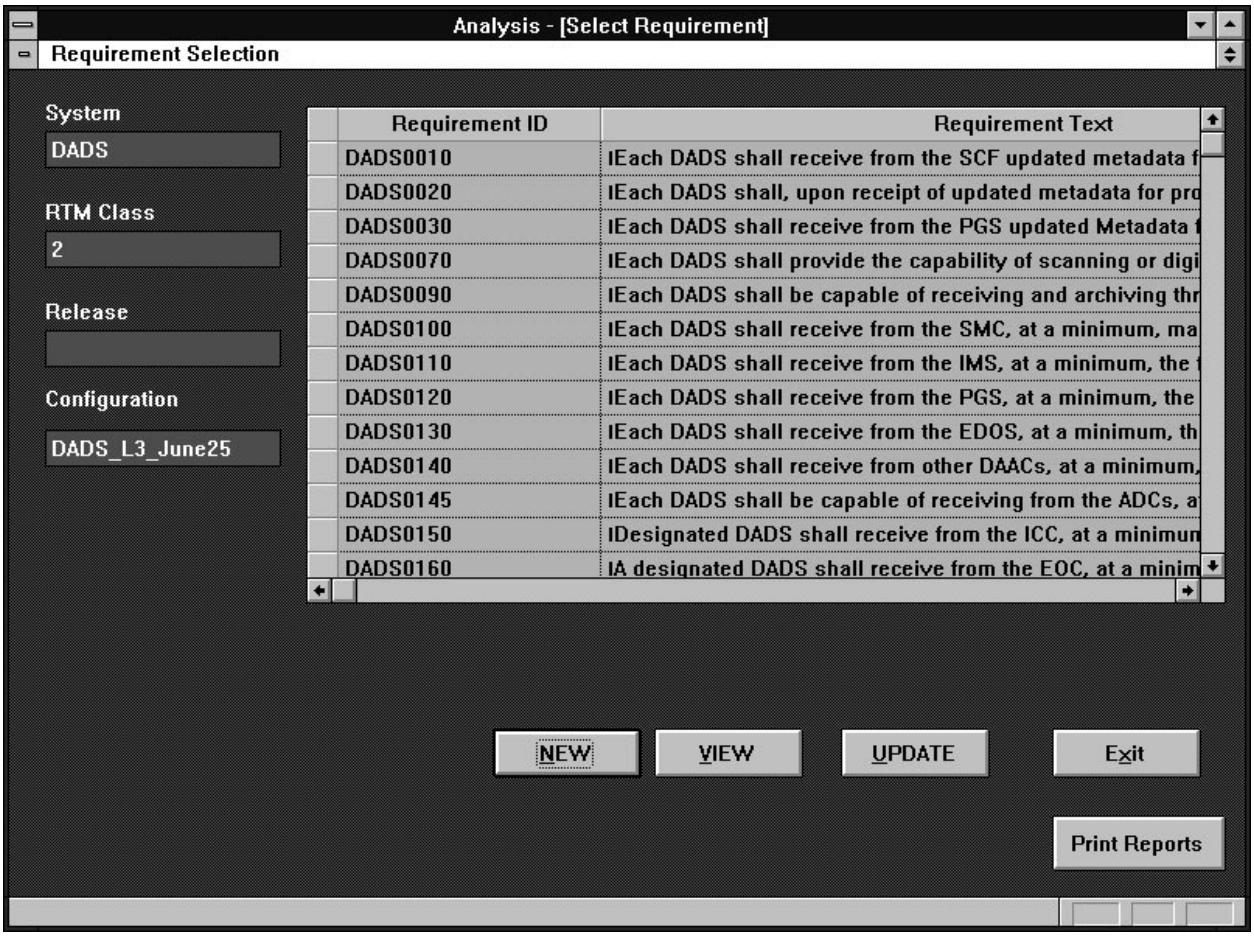

Exhibit 4.1.1-5 ARDB Requirement Analysis Selection Screen

4.1.1.5. ARDB Requirement Analysis Screen

The ARDB Requirement Analysis screen displays an individual requirement and any analysis issues associated with it.

FIELDS:

1. Analyst
   The Analyst text field displays the analyst name that will be associated with this analysis. It is populated based on login to the application.
2. Date of Analysis
   The Date of Analysis field displays the date the analysis takes place.
3. Requirement ID
   The Requirement ID text field displays the requirement identification number (PARAGRAPH_ID in RTM).
4. Configuration
   The Configuration text field displays the configuration identification test string for the requirement under analysis.

5. Requirement Text
   The Requirement Text field displays the actual wording of the requirement as stored in RTM/Oracle.
6. Issue Type
   The Issue Type text column portion of the table displays the type of issue (Quality or Traceability).
7. Issue
   The Issue text column portion of the table displays the actual issue addressed.
8. Description
   The Description text column portion of the table displays the analyst's description of the issue.
9. Recommendation
   The Recommendation text column portion of the table displays the analyst's recommendation.
10. Problem Class
    The Problem Class text column portion of the table displays the class of problem defined by the analyst (see quality/testability and traceability screen sections for listing of problem classes).
11. Traceability Rating
    The Traceability Rating combo box pulls down to display the categories: No Problem, Minor Problem, Moderate Problem, Major Problem.
12. Quality Rating
    The Quality Rating combo box pulls down to display the categories: No Problem, Minor Problem, Moderate Problem, Major Problem.
13. Testability Rating
    The Testability Rating combo box pulls down to display the categories: No Problem, Minor Problem, Moderate Problem, Major Problem.

The Requirement ID and Requirement Text are drawn from the RTM/Oracle database. The Analyst is drawn from the analysts table. The remaining fields are drawn from and saved to the **issue** table.

BUTTONS:

1. Add Issue
   The Add Issue button invokes a dialog box which prompts the user to choose either Quality/Testability or Traceability.
2. Delete Issue
   The Delete Issue button prompts the user for verification then deletes the highlighted issue
3. Edit Issue
   The Edit Issue button allows the user to modify the highlighted issue.
4. Close and Save
   The Close and Save button closes the window and saves all data to the database.
5. Exit

The Exit button closes the window without saving after prompting user for confirmation.

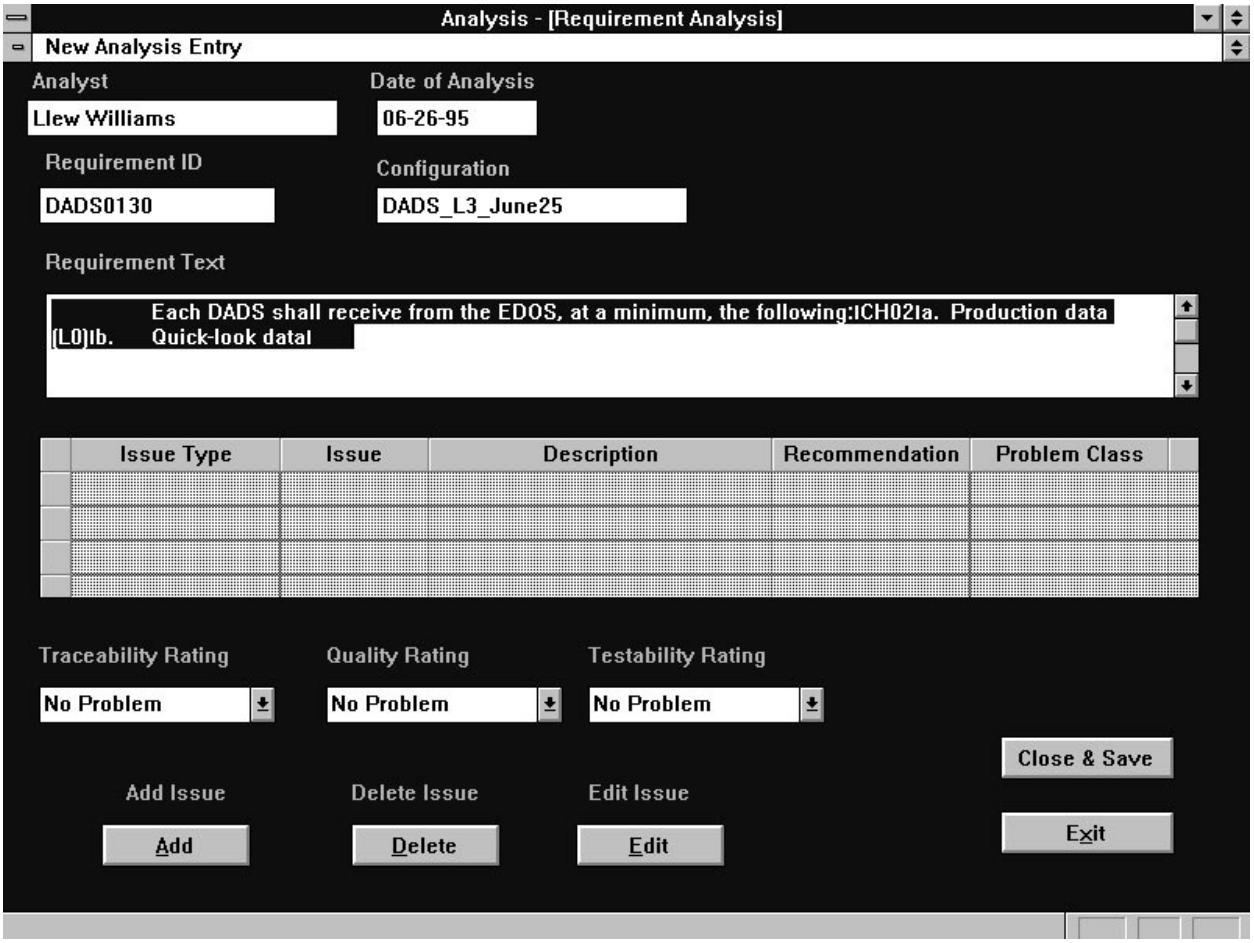

Exhibit 4.1.1-6 ARDB Requirement Analysis Screen

4.1.1.6. ARDB Analysis Quality/Testability Screen

The Analysis Quality/Testability screen enables users to enter issues relating to quality or testability.

FIELDS:

1. Issue
   The Issue combo box pulls down to display the categories: Ambiguity, Completeness, Consistency, Flexibility.
2. Problem Class
   The Problem Class combo box pulls down to display the categories: Inconsistent Level of Detail, Incomplete Requirement, Redundant Requirement, Broad Scope/Ambiguous Wording.

3. Issue Description
   The Issue description multi-line field captures an analyst's description of the issue.
4. Issue Recommendation
   The Issue Recommendation multi-line field captures an analyst's recommendation for correcting the issue.

All data fields are stored in the **issue** table in the SYBASE database.

BUTTONS:

1. OK
   The OK button places the data captured on this screen into memory in preparation for saving into the database when analysis is complete. The window is closed and control returns to the Requirement Analysis window after the data is saved.
2. Cancel
   The Cancel button closes the window without saving any data and returns control to the Requirement Analysis window.

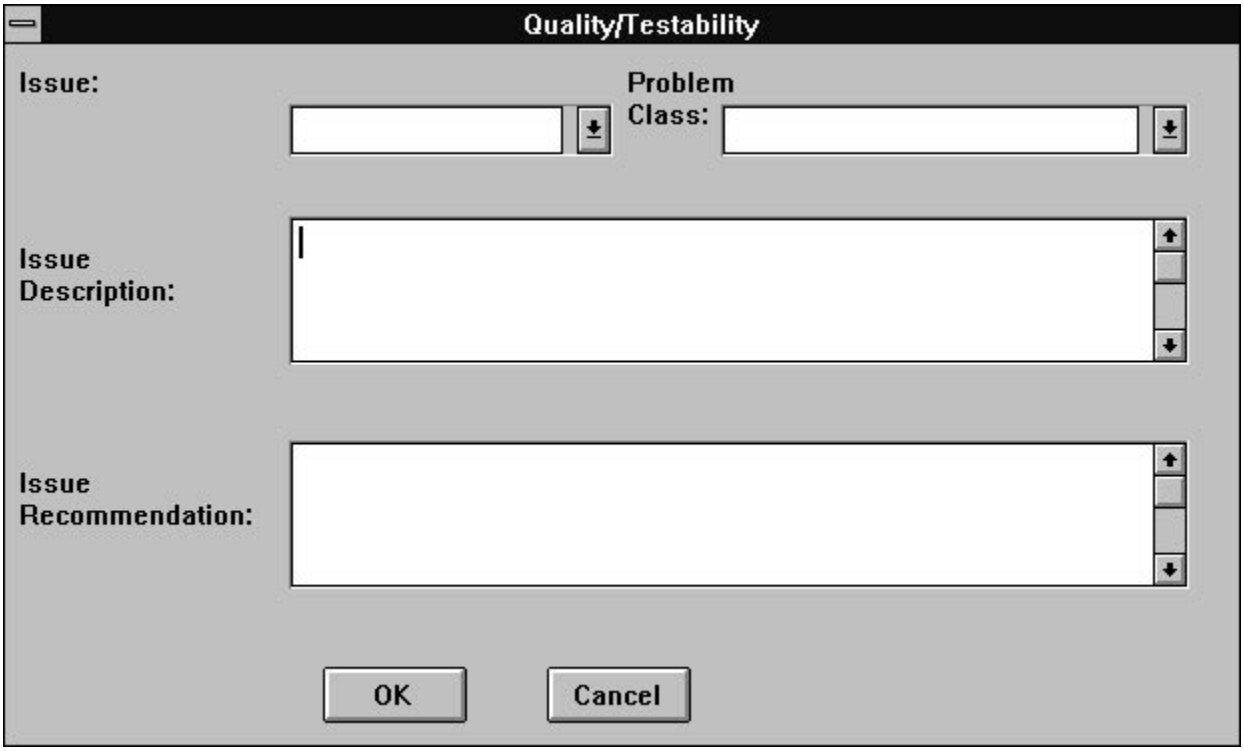

Exhibit 4.1.1-7 ARDB Analysis Quality/Testability Screen

4.1.1.7. ARDB Analysis Traceability Screen

The Analysis Traceability Screen is used to capture data pertaining to traceability issues identified during the requirement analysis.

FIELDS:

1. Issue
   The Issue combo box pulls down to display the categories: Missing, Orphan, Weak.
2. Problem Class
   The Problem Class combo box pulls down to display the categories: No Valid Trace Specified, Questionable Trace.
3. Reqm't ID
   The Reqm't ID text field captures the requirement identification number of the requirement linked to the requirement under analysis.
4. Class
   The Class text field captures the RTM class of the requirement that is linked to the requirement under analysis.

All data fields are stored in the **issue** table in the SYBASE database.

BUTTONS:

1. Delete Trace
   The Delete Trace radio button captures a recommendation of "Delete Trace" when selected.
2. Add Trace
   The Add Trace radio button captures a recommendation of "Add Trace" when selected.
3. OK
   The OK button places the data captured on this screen into memory in preparation for saving into the database when analysis is complete. The window is closed and control returns to the Requirement Analysis window after the data is saved.
4. Cancel
   The Cancel button closes the window without saving any data and returns control to the Requirement Analysis window.

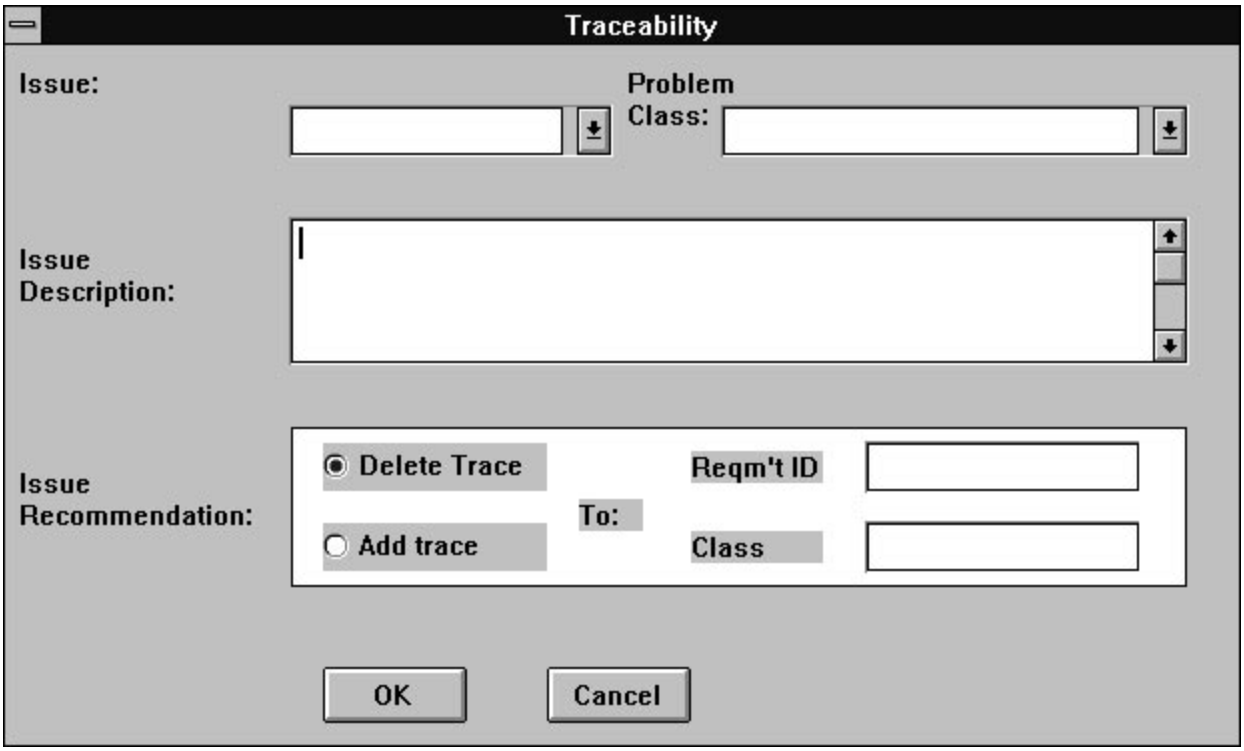

Exhibit 4.1.1-8 ARDB Analysis Traceability Screen

4.1.1.8. ARDB Report Selection Screen

The Report Selection Screen provides the means to generate reports based on specific criteria. Overall summary reports are available as well as reports specifically focused on traceability or quality issues. The report generation screen will be enhanced to allow the creation of custom reports based on any of the fields stored by the application.

The actual format and reporting options associated with the Report Selection screen is TBD.

4.1.2. ARDB Database Schema Design

Exhibit 4.1.2-1 depicts the ARDB database schema. The tables enclosed in the box are resident in the RTM/Oracle database. All other tables reside in the SYBASE database.

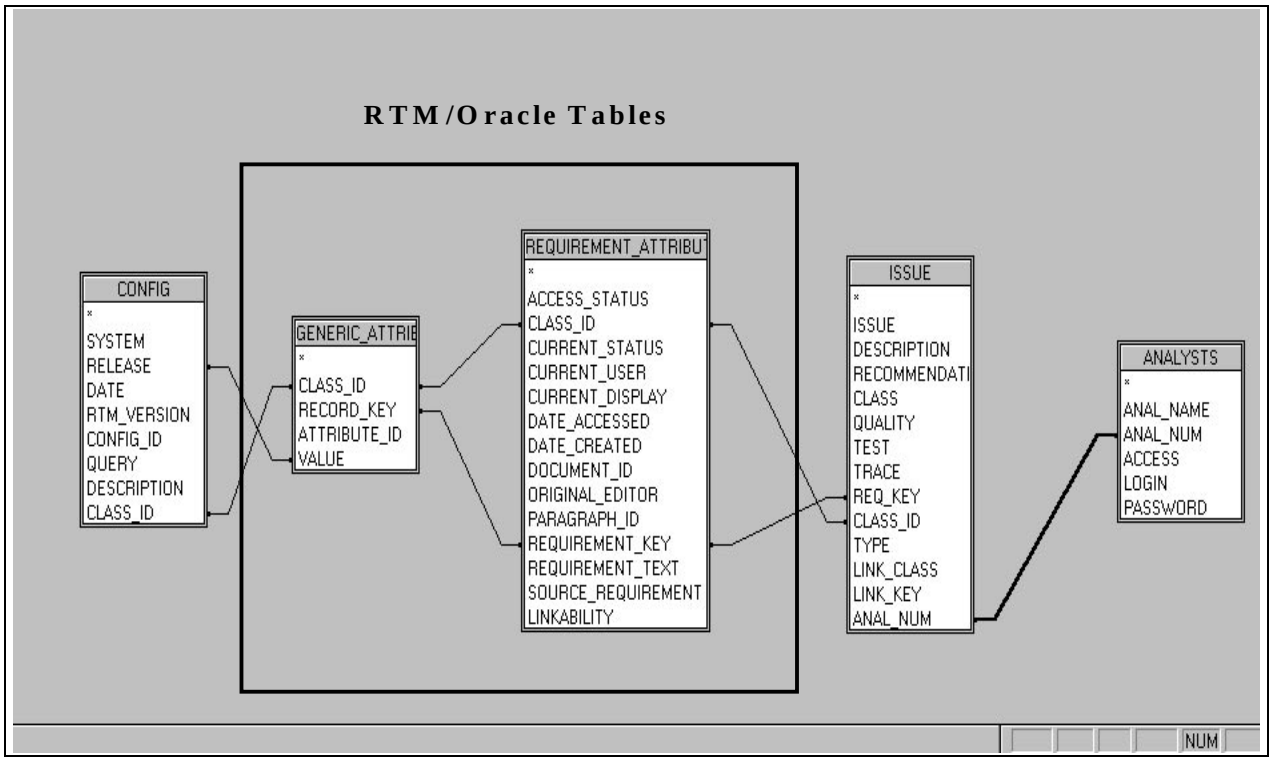

Exhibit 4.1.2-1 ARDB Database Schema Design

4.1.2.1. ARDB Issue Table

The **issue** table captures the results of the requirement analysis. Results are captured in terms of type of issue, a brief description of the issue, the analyst's recommendation, the class of issue, a numerical scoring in terms of overall quality, testability, and traceability, the actual category of issue, and in the case of a traceability issues the unique key of the requirement that is linked to the requirement under analysis. The key for this table consists of the fields req_key and class_id.

FIELD NAME	DATA TYPE	SIZE	NULL
issue	varchar	75	NOT NULL
description	text	16	NOT NULL
recommendation	text	16	NOT NULL
class	varchar	75	NOT NULL
quality	integer	4	NOT NULL
test	integer	4	NOT NULL
trace	integer	4	NOT NULL
req_key	integer	4	NOT NULL
class_id	varchar	30	NOT NULL
type	varchar	30	NOT NULL
link_class	varchar	30	

link_key	varchar	30	
anal_num	integer	4	NOT NULL

Table 4.1.2-2 ARDB Issue Table

4.1.2.2. ARDB Analysts Table

The **analysts** table contains data pertaining to each of the users of the ARDB. Access level and security are controlled by the records in this table. The primary key for this table is the unique analyst number that is stored in the anal_num field.

FIELD NAME	DATA TYPE	SIZE	NULL
anal_name	VARCHAR	30	NOT NULL
anal_num	INTEGER	4	NOT NULL
access	INTEGER	4	NOT NULL
login	VARCHAR	20	NOT NULL
password	VARCHAR	20	NOT NULL

Table 4.1.2-3 ARDB Analysts Table

4.1.2.3. ARDB Config Table

The **config** table captures the data necessary to define a subset of requirements. A configuration consists of a grouping of requirements in terms of date of configuration, system, release, date of RTM export, RTM class (level). The primary key for this table is the unique Configuration ID text field labeled as config_id.

FIELD NAME	DATA TYPE	SIZE	NULL
system	varchar	30	
release	varchar	75	
date	datetime	8	NOT NULL
rtm_version	varchar	75	NOT NULL
config_id	varchar	75	NOT NULL
query	varchar	240	NOT NULL
description	varchar	240	NOT NULL
class_id	varchar	30	NOT NULL

Table 4.1.2-4 ARDB Config Table

4.2. Interface Analysis Database (IADB) Design

The Interface Analysis Database (IADB) facilitates the capture and analysis of potentially conflicting interface specifications derived from multiple sources. The basic approach is to manage a hierarchy of document, interface, and data item definitions and specifications, which are manually extracted from source documents and entered into the database. Analysts use predefined queries and formats in the IADB to generate reports documenting the completeness and consistency of the specifications, both within and between documents. The IADB supports concurrent entry and analysis of interface specifications by multiple users. All document titles, component/element/system names, organization names, and data item class names are stored in tables and can be created, edited and deleted through the IADB user interface.

Interface analysis is supported at both the interface requirements document (IRD) and interface control document (ICD) levels. At the IRD level, IRDs are analyzed for internal consistency and completeness, as well as for consistency with other comparably detailed documents. To support internal consistency analysis, each IRD is divided into three subsections: requirements, interface chart (i.e., table), and interface diagram. Separate interface and data item specifications are maintained for each subsection of each IRD. For the purpose of analyzing consistency between IRDs, and between IRDs and other documents, the requirements subsection is used as the baseline specification. The IADB enables analysts to electronically import and link IRD requirements to the data item specifications to which each requirement pertains, assuring the accuracy of the data item specifications with respect to the source requirements. To manage inconsistent names for data items between source documents, analysts specify alias, sub-item and subclass relationships between names using an integrated data dictionary.

To support end-to-end consistency and completeness analysis at the IRD level, the IADB supports the association of component/element/system input-to-output data flows via intermediate, analyst-defined functions. This is accomplished via the following steps:

1. The analyst electronically imports the IRD requirements.
2. The analyst associates the imported requirements with the corresponding source document title and version.
3. For each source document, the analyst associates each requirement with the component(s)/element(s)/system(s) to which the requirement applies.
4. For each component/element/system, the analyst defines the functions provided and associates each requirement with one or more functions.
5. For each component/element/system and function, the analyst associates input and output data flows.

Once the input-to-output relationships are established, they are used to generate end-to-end data communications, processing and storage flows. This supports verification of the logical consistency and completeness of the interface specifications on an end-to-end basis.
At the ICD level, the IADB supports the following types of consistency and completeness analyses:

- Consistency of each ICD with the parent IRD(s)
- Internal consistency of each ICD

- Internal completeness of each ICD

The precise methodology and IADB user interface design for ICD-level analysis is TBD. As we define our detailed approach, we will update this document accordingly.

4.2.1. IADB GUI Design

Exhibit 4.2.1-1 depicts the hierarchy of major windows and dialogue boxes for the IADB.

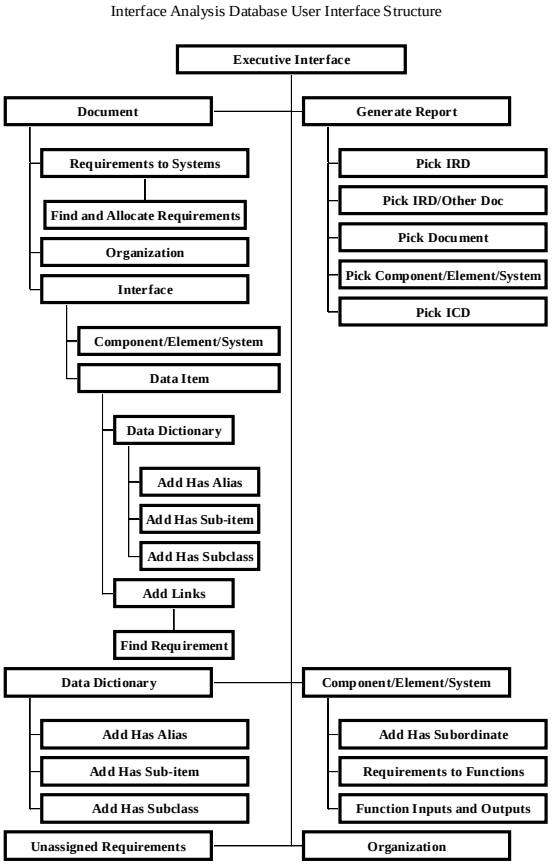

Exhibit 4.2.1-1 IADB User Interface Hierarchy

The following subsections detail the major windows and dialogue boxes of the IADB user interface.

4.2.1.1. IADB Executive Interface Screen

The Executive Interface Screen opens automatically when the IADB application is launched. The Executive Interface provides the user with the top-level choices within the IADB, including the following:

- Create, browse and edit interface specifications, including document definitions, interfaces, data item specifications, and links to requirements
- Generate any of a variety of consistency and completeness reports
- Create, browse and edit data item class definitions and interrelationships

- Associate requirements with source documents
- Create, browse and edit component/element/system definitions
- Create, browse and edit organization definitions

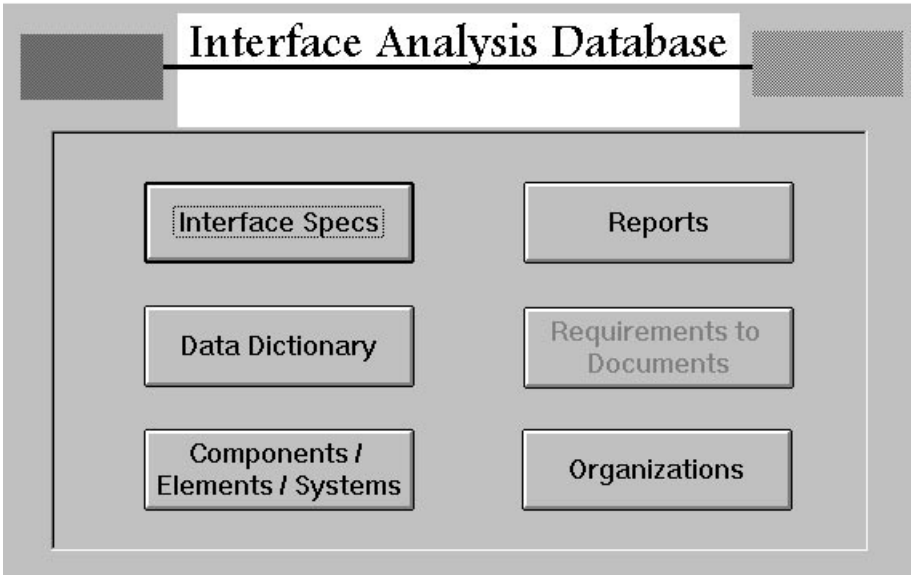

Exhibit 4.2.1-2 IADB Executive Interface Screen

The table below reflects the IADB executive interface buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Interface Specs	Opens Document screen
Reports	Opens Generate Report screen
Data Dictionary	Opens Data Dictionary (Data Item Class) screen
Requirements to Documents	Opens Unassigned Requirements screen (enabled only when Requirements table contains unassigned requirements)
Components / Elements / Systems	Opens Component/Element/System screen
Organizations	Opens Organization screen

4.2.1.2. IADB Documents Screen

The Documents Screen enables creation, browsing and editing of document definitions, browsing and deletion of associated interfaces, and opening of the Requirements to Systems, Organizations, and Interface screens.

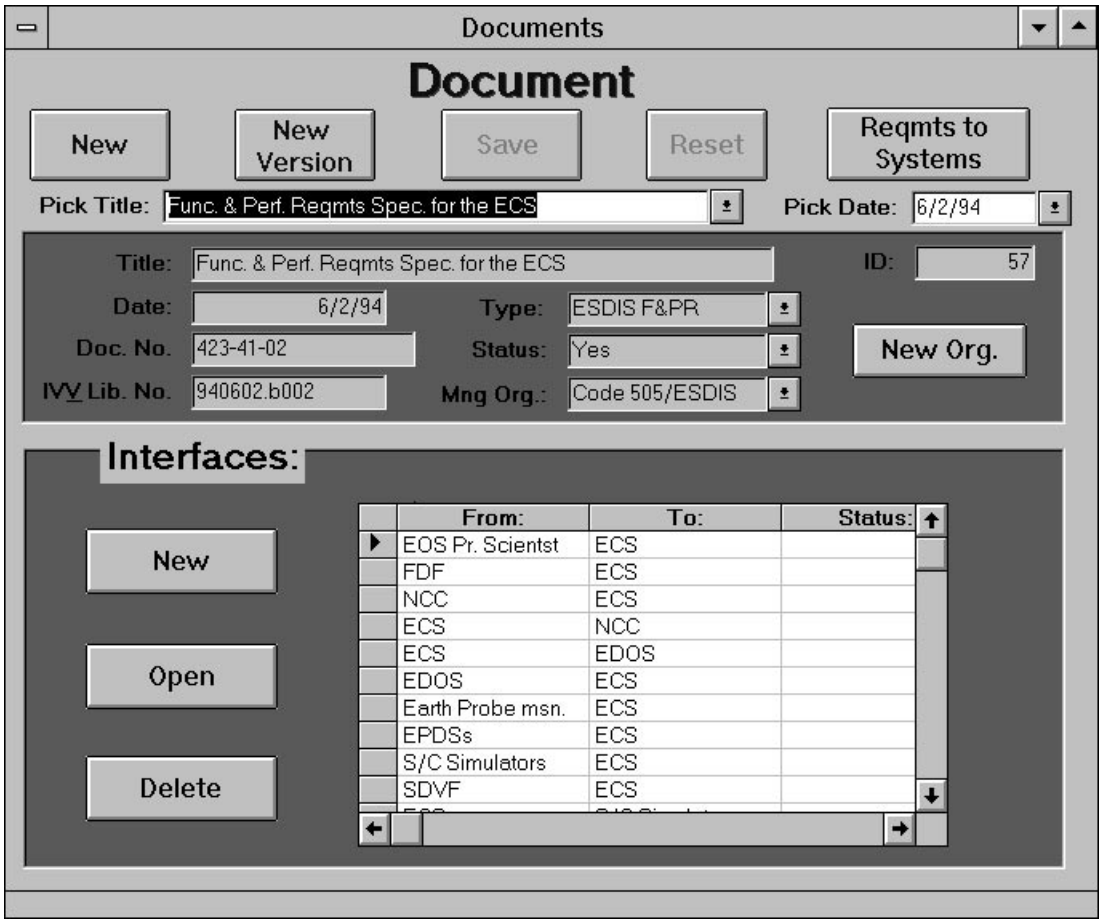

Exhibit 4.2.1-3 IADB Document Screen

The table below reflects the Document Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
New [Document]	Clears document screen for new document definition
New Version	Opens a document selection screen to enable generation of a copy of its database contents as a point of departure for a entering a new version
Save	Saves the current contents of the screen
Reset	Undoes unsaved changes to the screen
Requirements	Opens Requirements screen to display requirements associated with current document
New Org.	Opens Organization screen to enable entry of a new organization definition
New [Interface]	Opens Interface screen for entry of a new interface definition
Open	Opens Interface screen to selected interface
Delete	Deletes selected interface definition and associated data items

The table below details the Document Screen fields, data types and sources.

Field	Data Type	Source
Pick Title	text	document titles
Pick Date	date/time	document dates given title
Title	text box	selected title
ID	integer	selected document ID
Date	date/time	selected date
Type	text	selected document type
Doc No.	text	selected document number
Status	text	selected document status
IVV Lib. No.	text	selected document IVV library number
Mng. Org.	displays text (organization name) stores integer (organization ID)	organization linked to selected document
From	text	component/element/system ID/name
To	text	component/element/system ID/name
Status	text	TBD

4.2.1.3. IADB Organization Screen

The Organization Screen enables the creation, browsing and editing of organization definitions.

Exhibit 4.2.1-4. IADB Organization Screen

The table below reflects the Organization Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
New	Clears screen for new organization definition

Save	Saves the current contents of the screen
Reset	Undoes unsaved changes to the screen

The table below details the Organization Screen fields, data types and sources.

Field	Data Type	Source
Organization Name	Text	Organization name
Organization ID	Integer	Organization ID

4.2.1.4. IADB Unassigned Requirements Screen

The Unassigned Requirements Screen is used to associate imported requirements with the appropriate source document. The approach is to import one set of requirements at a time into the Tempreq table, copy the requirements into the Requirements table, and then open the Unassigned Requirements screen from the Executive Interface and select the appropriate source document.

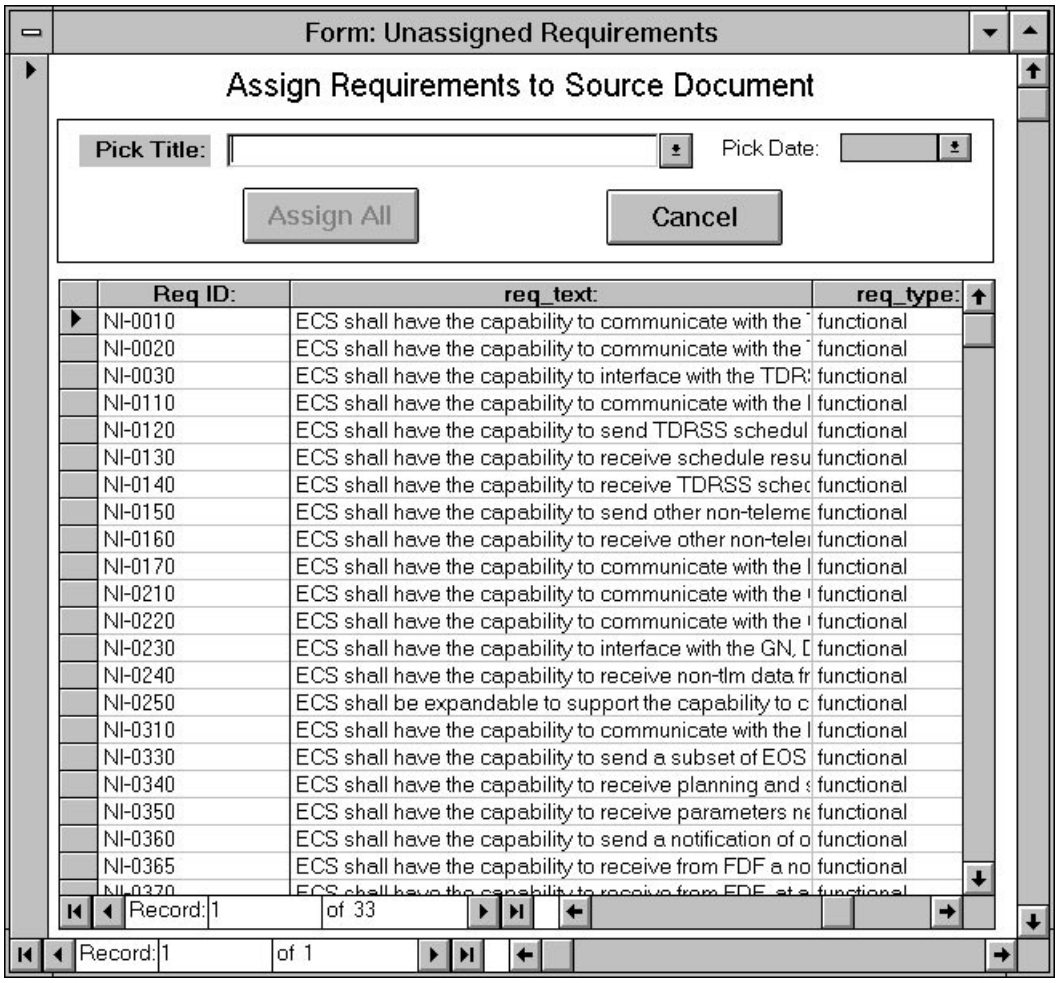

Exhibit 4.2.1-5 IADB Unassigned Requirements Screen

The table below reflects the Unassigned Requirements Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Assign All	Assigns requirements to selected document
Cancel	Closes the screen without assigning requirements to a document

The table below details the Unassigned Requirements Screen fields, data types and sources.

Field	Data Type	Source
Pick Title	Text	Document titles
Pick Date	Date/time	Document dates given title
Req_title	text	programmatic title for requirement
Req_text	memo	requirement text
Req_type	text	functional, performance, operational, interface

4.2.1.5. IADB Requirements to Systems Screen

This screen enables the analyst to associate each requirement from a given document with the components, elements, and/or systems to which the requirement applies.

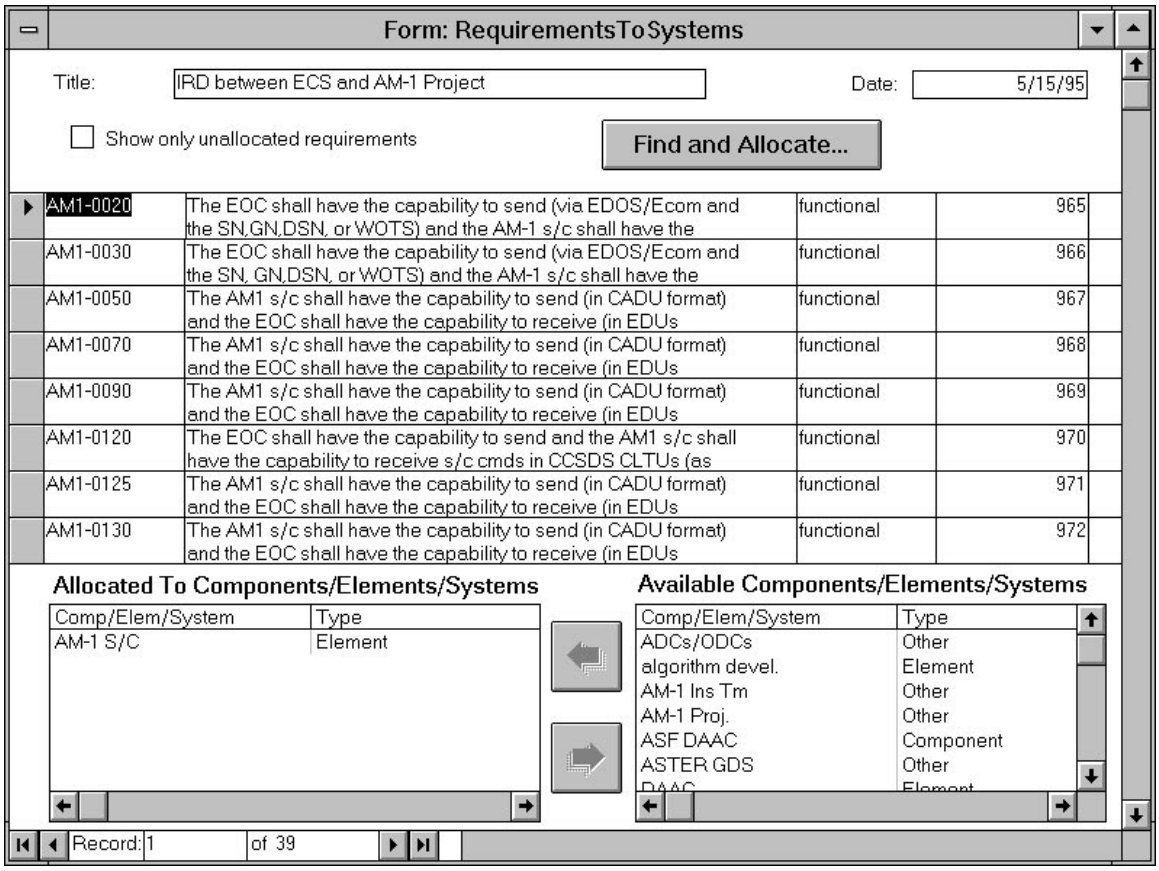

Exhibit 4.2.1-6 IADB Requirements to Systems Screen

The table below reflects the Requirements to Systems Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Find and Allocate...	Opens the Find and Allocate screen from which requirements containing specific strings can be assigned to a specified component, element or system
Allocate (Left) Arrow	Allocates the selected requirement to the component, element or system selected in the “Available” list
Deallocate (Right) Arrow	Deallocates the selected requirement from the component, element or system selected in the “Allocated To” list

The table below details the Requirements to Systems Screen fields, data types and sources.

Field	Data Type	Source
Title	Text	Document title
Date	Date/time	Document date
Req_title	text	programmatic title for

		requirement
Req_text	memo	requirement text
Req_type	text	functional, performance, operational, interface
Req_id	integer	internally assigned requirement ID
Allocated to Components / Elements / Systems	displays text stores integer	abbreviated names/types/IDs for components / elements / systems to which selected requirement has been allocated
Available Components / Elements / Systems	displays text stores integer	abbreviated names/types/IDs for components / elements / systems to which selected requirement has not been allocated

4.2.1.6. IADB Interface Screen

The Interface Screen enables the creation and browsing of interfaces associated with a given document, the browsing and deletion of associated data items, the opening of the Component/Element/System and Data Item screens.

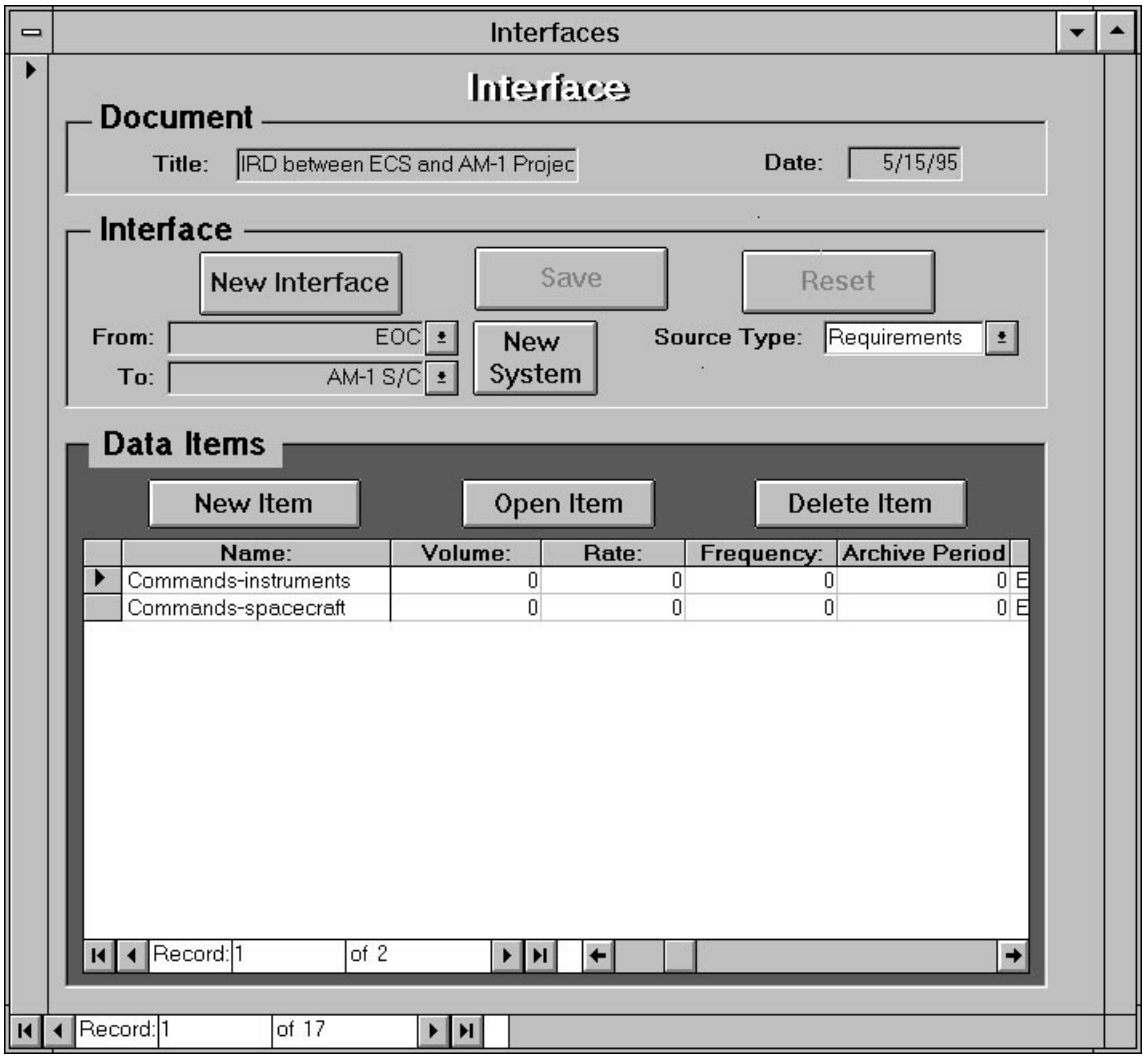

Exhibit 4.2.1-7 IADB Interface Screen

The table below reflects the Interface Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
New Interface	Clears screen for new interface definition
Save	Saves the current contents of the screen
Reset	Undoes unsaved changes to the screen

The table below details the Interface Screen fields, data types and sources.

Field	Data Type	Source
Title	text	Document title
Date	date/time	Document date

From	text	component/element/system ID/name
To	text	component/element/system ID/name
Source Type	text	"Requirements", "Chart", or "Diagram"
Name [Data Item]	text	data item class name
Volume	number	data flow volume
Volume Units	text	volume units
Rate	number	data flow rate
Rate Units	text	rate units
Frequency	number	data flow frequency
Frequency Units	text	frequency units
Archive Period	number	archive period
Archive Period Units	text	archive period units

4.2.1.7. IADB Component/Element/System Screen

This screen enables (1) the creation, browsing and editing of component/element/system definitions, (2) creation, editing and deletion of sub-element relationships between components, elements and systems, and (3) the opening of the Organization screen and Function Inputs and Outputs screen.

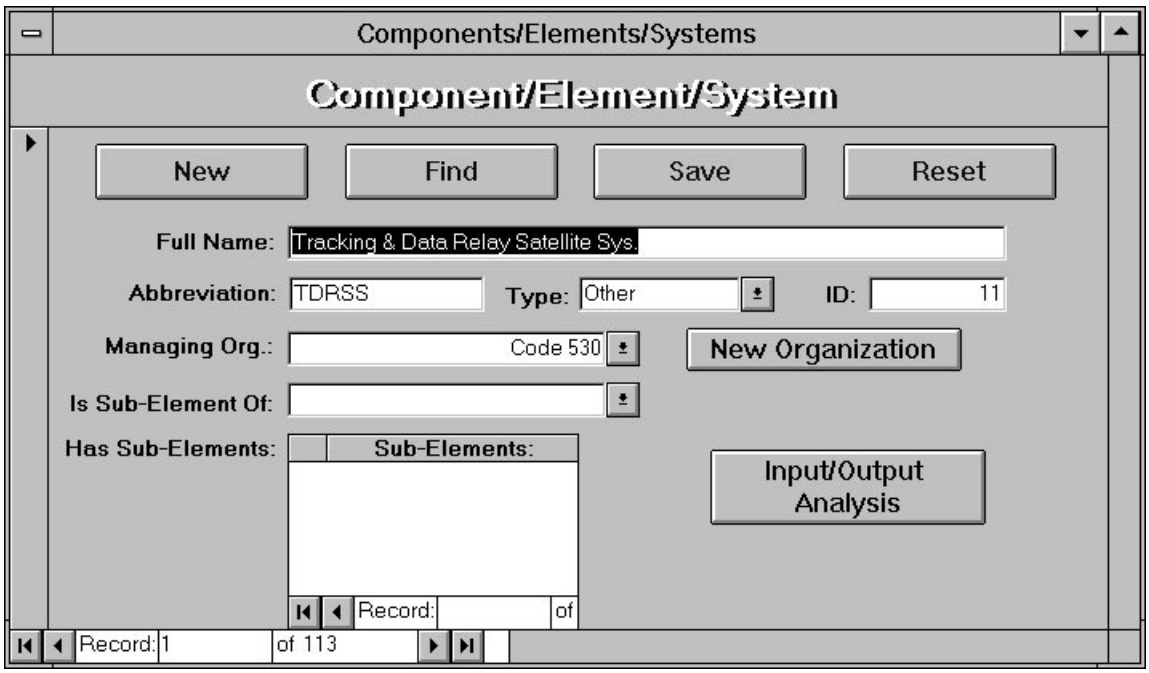

Exhibit 4.2.1-8 IADB Component/Element/System Screen

The table below reflects the Component/Element/System Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
New	Clears screen for new component/element/system definition
Find	Opens a subordinate dialogue box to find a specified component/element/system
Save	Saves the current contents of the screen
Reset	Undoes unsaved changes to the screen
New Organization	Opens the Organization screen for entry of a new organization definition
Input/Output Analysis	Opens the Function Inputs and Outputs screen for the current component/element/system

The table below details the Component/Element/System Screen fields, data types and sources.

Field	Data Type	Source
Full Name	text	component/element/system name
Abbreviation	text	component/element/system abbreviation
Type	text	component, element or system
ID	integer	component/element/system ID
Managing Org.	displays text stores integer	name/ID of the managing organization
Is Sub-element Of	displays text stores integer	name/ID of the parent component/element/system
Has Sub-elements	displays text stores integer	names/IDs of the subordinate components/elements/systems

4.2.1.8. IADB Requirements to Functions Screen

This screen is used to associate a given component/element/system's requirements with analyst-defined functions, which in turn provide the basis for logically relating input and output data flows.

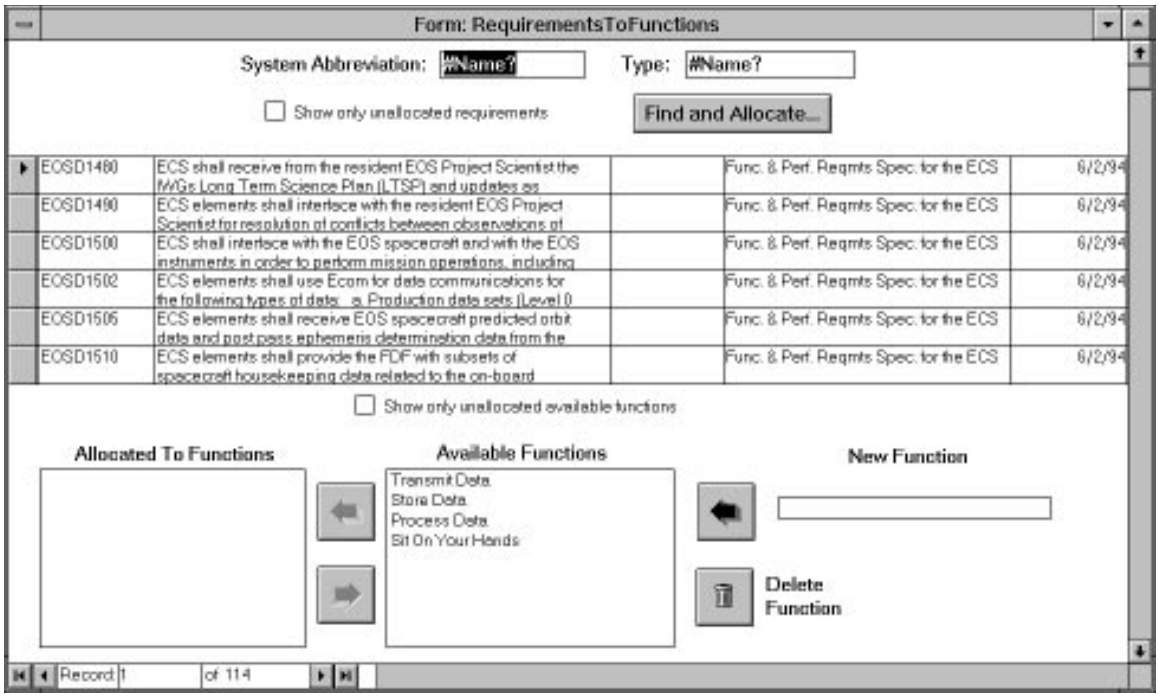

Exhibit 4.2.1-9 IADB Requirements to Functions Screen

The table below reflects the Requirements to Functions Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Find and Allocate...	Opens the Find and Allocate screen from which requirements containing specific strings can be assigned to a specified function
Allocate (Left) Arrow	Allocates the selected requirement to the function selected in the "Available" list
Deallocate (Right) Arrow	Deallocates the selected requirement from the function selected in the "Allocated To" list
Add Function (Left) Arrow	Associates a user-defined function with the current component/element/system, adding the function to the "Available" list
Delete Function (Trash Can)	Disassociates the function selected in the "Available" list from the current component/element/system and removes it from the "Available" list
Show Only Unallocated Requirements	When selected, displays only those requirements not already allocated to at least one function
Show Only Unallocated Functions	When selected, displays only those available functions not already allocated to at least one requirement

The table below details the Requirements to Functions Screen fields, data types and sources.

Field	Data Type	Source
System Abbreviation	text	component/element/system abbreviation
Type	text	component, element or system
Allocated to Functions	list of text	Functions associated with current component/element/system and currently selected requirement
Available Functions	list of text	Functions associated with current component/element/system but not with currently selected requirement
New Function	text	user-defined function assigned to current component/element/system
Req_id	integer	internally assigned requirement ID
Req_text	memo	requirement text
Req_type	text	functional, performance, operational, interface

4.2.1.9. IADB Function Inputs and Outputs Screen

The Function Inputs and Outputs screen enables the analyst to associate input and output data flows with each function for a given component/element/system.

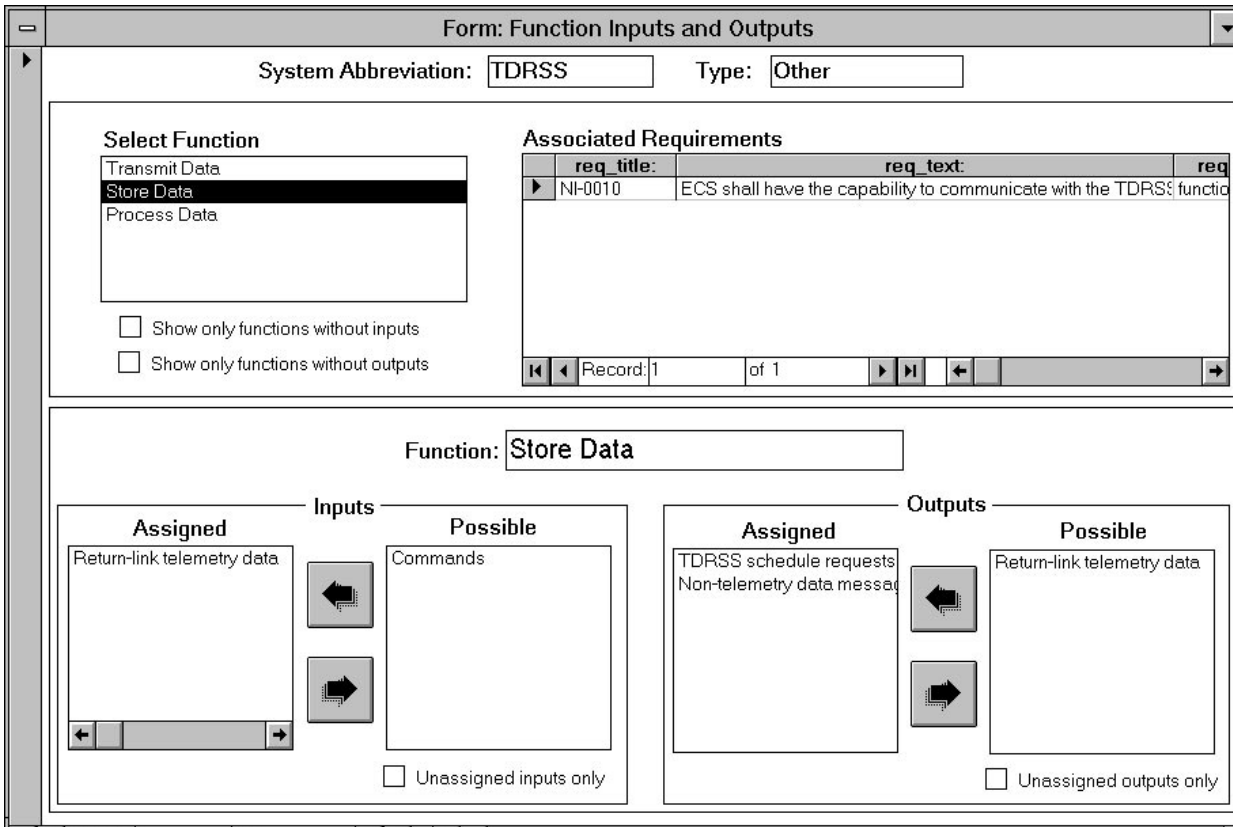

Exhibit 4.2.1-10 IADB Function Inputs and Outputs Screen

The table below reflects the Functions Inputs and Outputs Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Show Only Functions Without Inputs	When selected, displays only those functions to which no inputs have been assigned
Show Only Functions Without Outputs	When selected, displays only those functions to which no outputs have been assigned
Assign Input (Left) Arrow	Assigns the selected possible input to the selected function
De-assign Input (Right) Arrow	De-assigns the selected assigned input from the selected function
Only Unassigned Inputs	When selected, displays only those possible inputs that are not assigned to any functions
Assign Output (Left) Arrow	Assigns the selected possible output to the selected function
De-assign Output (Right) Arrow	De-assigns the selected assigned output from the selected function
Only Unassigned Outputs	When selected, displays only those possible outputs that are not assigned to any functions

The table below details the Function Inputs and Outputs Screen fields, data types and sources.

Field	Data Type	Source
System Abbreviation	text	component/element/system abbreviation
Type	text	component, element or system
Select Function		
Req_id	integer	internally assigned requirement ID
Req_text	memo	requirement text
Req_type	text	functional, performance, operational, interface
Function	text	displays selected function name from upper portion of window
Assigned Inputs	list of text	names of data item classes that have been assigned as inputs to selected function
Possible Inputs	list of text	names of data item classes that that are inputs to current component/element/system and which have not been assigned as inputs to selected function
Assigned Outputs	list of text	names of data item classes that have been assigned as outputs to selected function
Possible Outputs	list of text	names of data item classes that that are outputs of current component/element/system and which have not been assigned as outputs of selected function

4.2.1.10. IADB Data Item Screen

The Data Item Screen enables the (1) creation, browsing and editing of data items for a given document and interface, (2) browsing and deletion of links to requirements, and (3) the opening of the Data Dictionary and Add [requirement] Links screens.

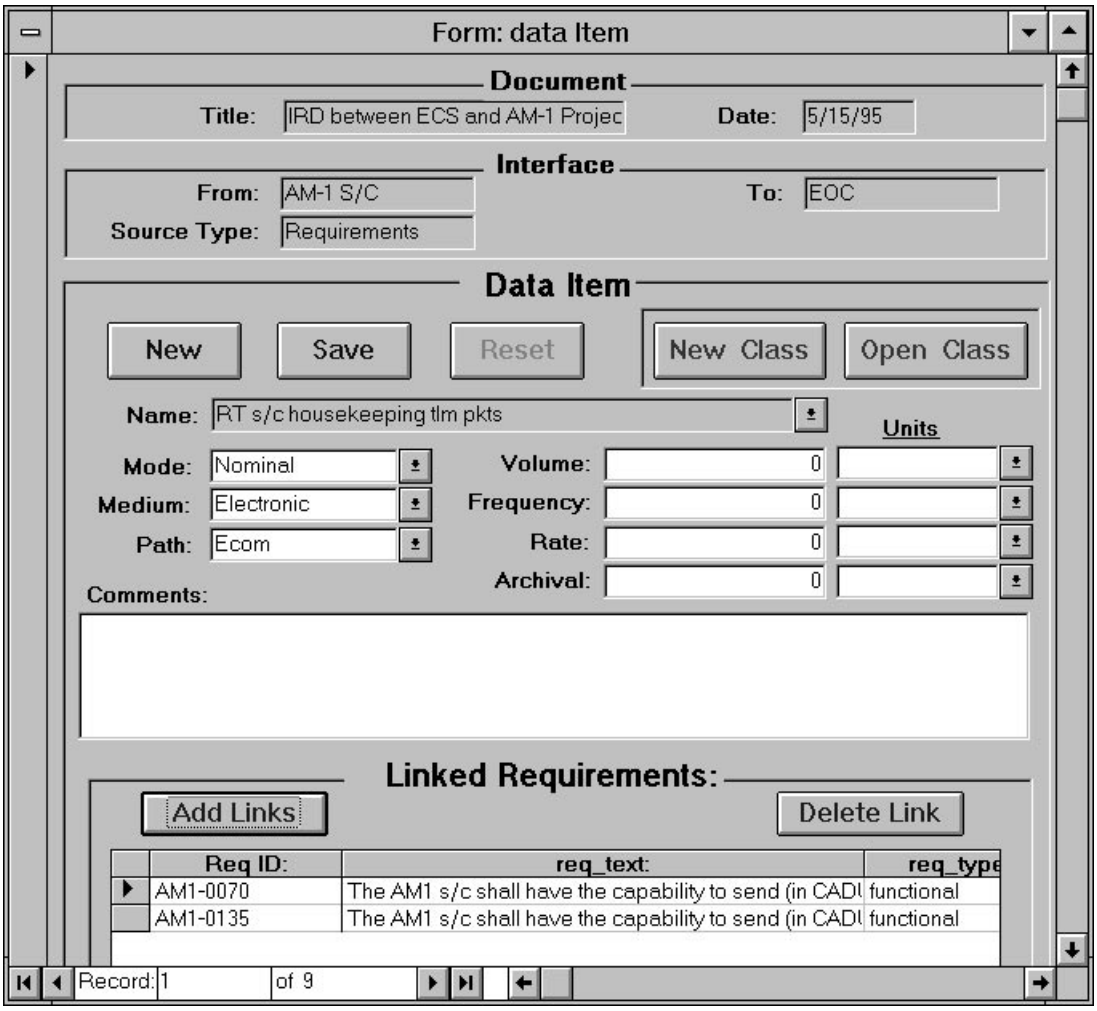

Exhibit 4.2.1-11 IADB Data Item Form Screen

The table below reflects the Data Item Form buttons and the corresponding actions that are taken once a selection is made.

Button	Action
New	Clears screen for new interface definition
Save	Saves the current contents of the screen
Reset	Undoes unsaved changes to the screen
New Class	Opens the Data Dictionary screen for entry of a new data item class
Open Class	Opens the Data Dictionary screen to the current data item class
Add Links	Opens the Add Requirement Links screen for creation of new requirement links
Delete Link	Deletes the link between the current data item and the currently selected requirement

The table below details the Data Item Screen fields, data types and sources.

Field	Data Type	Source
Title	text	Document title
Date	date/time	Document date
From	text	component/element/system ID/name
To	text	component/element/system ID/name
Source Type	text	“Requirements”, “Chart”, or “Diagram”
Name [Data Item]	text	data item class name; entry of undefined name automatically adds name to data dictionary
Mode	text	operational mode, e.g., pre-launch, launch, nominal operations...
Medium	text	communications medium, e.g., voice, paper, electronic...
Path	text	electronic communications path, e.g., Ecom, NOLAN...
Volume	number	data flow volume
Volume Units	text	volume units
Rate	number	data flow rate
Rate Units	text	rate units
Frequency	number	data flow frequency
Frequency Units	text	frequency units
Archive Period	number	archive period
Archive Period Units	text	archive period units
Comments	memo	comments between analysts
Req_id	integer	internally assigned requirement ID
Req_text	memo	requirement text
Req_type	text	functional, performance, operational, interface

4.2.1.11. IADB Add Requirement Links Screen

This screen is opened from the Data Item screen to associate requirements from the current source document with the current data item specification. Find and Find Next buttons support the analyst in identifying potentially applicable requirements.

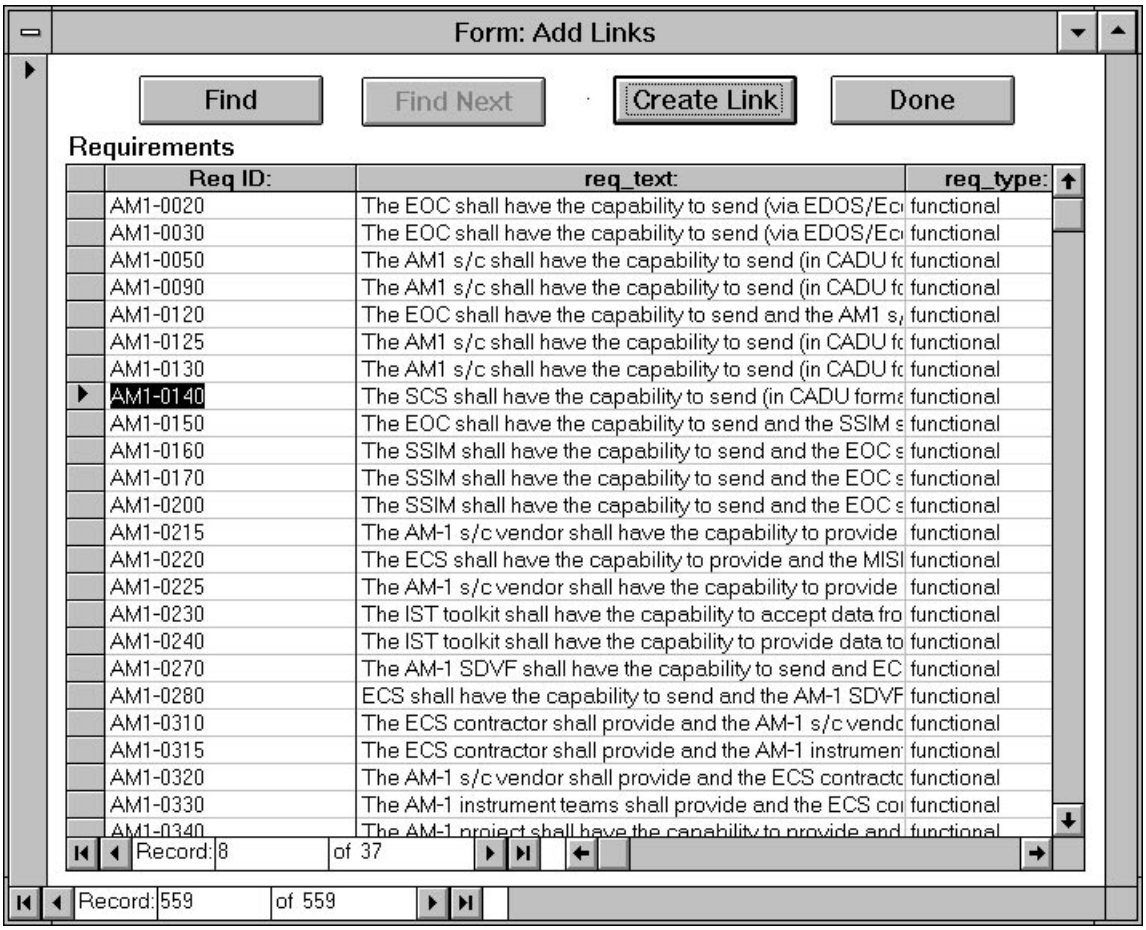

Exhibit 4.2.1-12 IADB Add Requirement Links Screen

The table below reflects the Add Requirement Links Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Find	Opens subordinate screen for specifying a character string to search for and a requirement field to search in
Find Next	Finds the next occurrence of the specified string in the specified field
Create Link	Links the currently selected requirement to the current data item specification
Done	Closes the Add Requirement Links screen

The table below details the Add Requirement Links Screen fields, data types and sources.

Field	Data Type	Source
Req_id	integer	internally assigned requirement ID
Req_text	memo	requirement text
Req_type	text	functional, performance,

		operational, interface

4.2.1.12. IADB Data Dictionary Screen

The Data Dictionary (Data Item Class) screen enables analysts to create, browse and edit data item class definitions, including the creation and deletion of alias, sub-item and subclass relationships between classes.

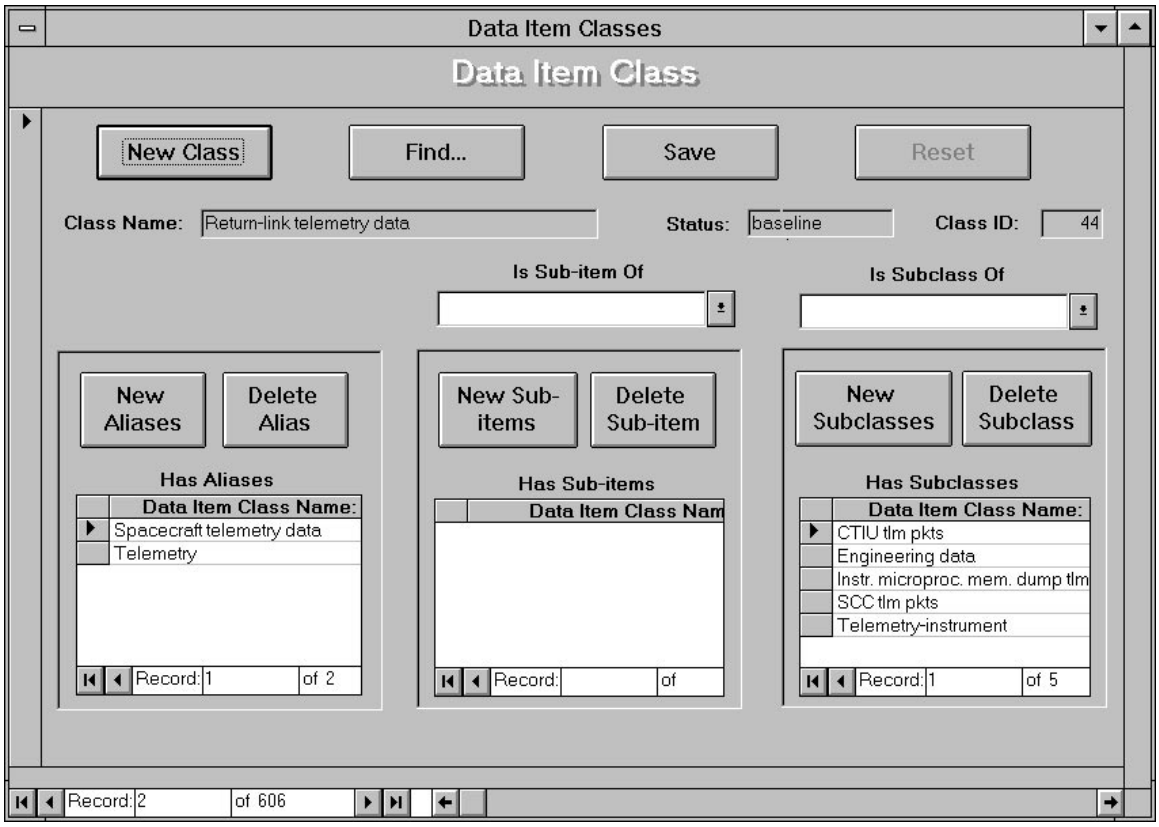

Exhibit 4.2.1-13 IADB Data Dictionary Screen

The table below reflects the Data Dictionary Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
New Class	Clears the screen for entry of a new data item class definition
Find	Opens subordinate screen for specifying the name of a data item class for which to search
Save	Saves the current contents of the screen
Reset	Undoes unsaved changes to the current data item class
New Aliases	Opens the Add Aliases screen to select additional aliases for the current class

Delete Alias	Deletes the currently selected alias relationship
New Sub-items	Opens the Add Sub-items screen to select additional sub-items for the current class
Delete Sub-item	Deletes the currently selected sub-item relationship
New Subclasses	Opens the Add Subclasses screen to select additional subclasses for the current class
Delete Subclass	Deletes the currently selected subclasses relationship

The table below details the Data Dictionary Screen fields, data types and sources.

Field	Data Type	Source
Class Name	text	data item class name
Status	text	baseline, alias or TBD
Class ID	integer	internally assigned data class ID
Is Alias For	displays text stores integer	Name/ID of the class for which the current class is an alias; visible only when status is TBD or alias
Is Sub-item Of	displays text stores integer	Name/ID of the class for which the current class is a sub-item; visible only when status is TBD or baseline
Is Subclass Of	displays text stores integer	Name/ID of the class for which the current class is a subclass; visible only when status is TBD or baseline
Has Aliases	displays text stores integer	Names/IDs of the classes that are aliases of the current class; visible only when status is TBD or baseline
Has Sub-items	displays text stores integer	Names/IDs of the classes that are sub-items of the current class; visible only when status is TBD or baseline
Has Subclasses	displays text stores integer	Names/IDs of the classes that are subclasses of the current class; visible only when status is TBD or baseline

4.2.1.13. IADB Add Aliases/Add Sub-items/Add Subclasses Screen

The Add Aliases, Add Sub-items, and Add Subclasses screens enable analysts to create relationships between the current data item class on the data dictionary screen and other classes selected from the subordinate screen(s). Only the Add Aliases screen is shown here, as the three screens are virtually identical.

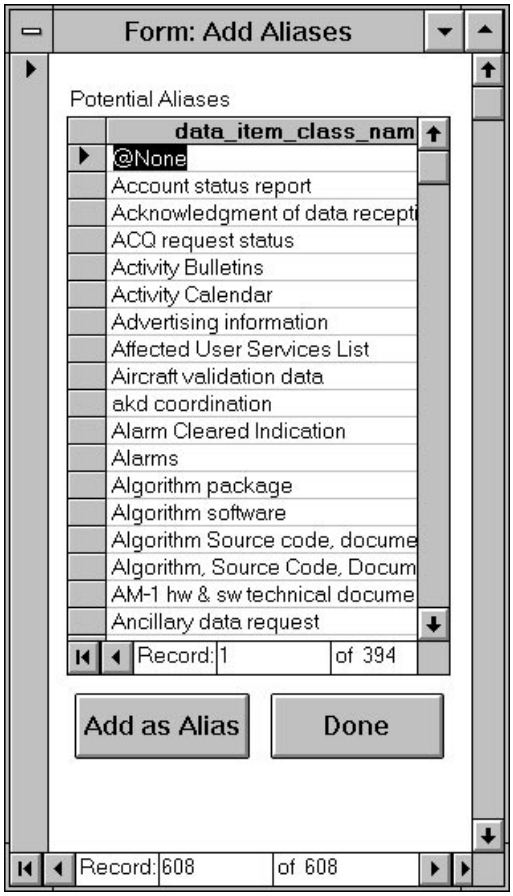

Exhibit 4.2.1-14 IADB Add Aliases Screen

The table below reflects the Add Aliases Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Add as Alias	Creates an alias relationship between the current data item class from the Data Dictionary screen and the currently selected data item class in the Add Aliases screen, and removes the latter from the selection list
Done	Closes the Add Aliases screen

The table below details the Add Aliases Form fields, data types and sources.

Field	Data Type	Source

Class Name	text	data item class names that are not already aliases for current data item class from Data Dictionary screen

4.2.1.14. IADB Generate Report Screen

This screen enables any of a variety of reports to be generated pertaining to the contents, consistency and completeness of the interface specifications and data dictionary.

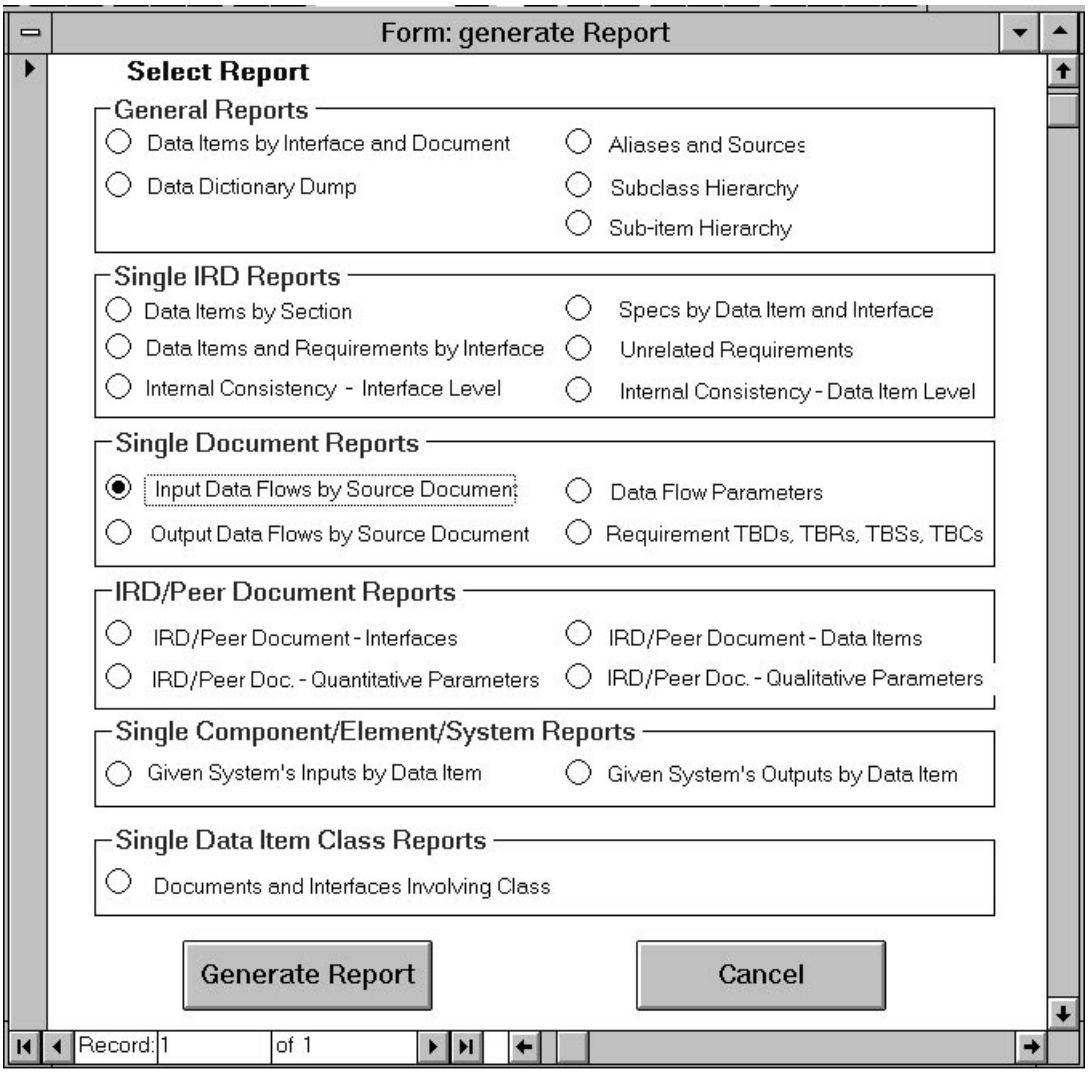

Exhibit 4.2.1-15 IADB Generate Report Screen

The table below reflects the Generate Report Screen buttons and the corresponding actions that are taken once a selection is made.

Button	Action
Generate Report	Either generates the selected report directly (for general reports) or opens a subordinate screen from which the user selects the document, component/element/system, or data item class upon which the report is to be based.
Cancel	Closes the Generate Report screen

4.2.2. IADB Database Schema Design

Exhibit 4.2.2-1 depicts the IADB database schema.

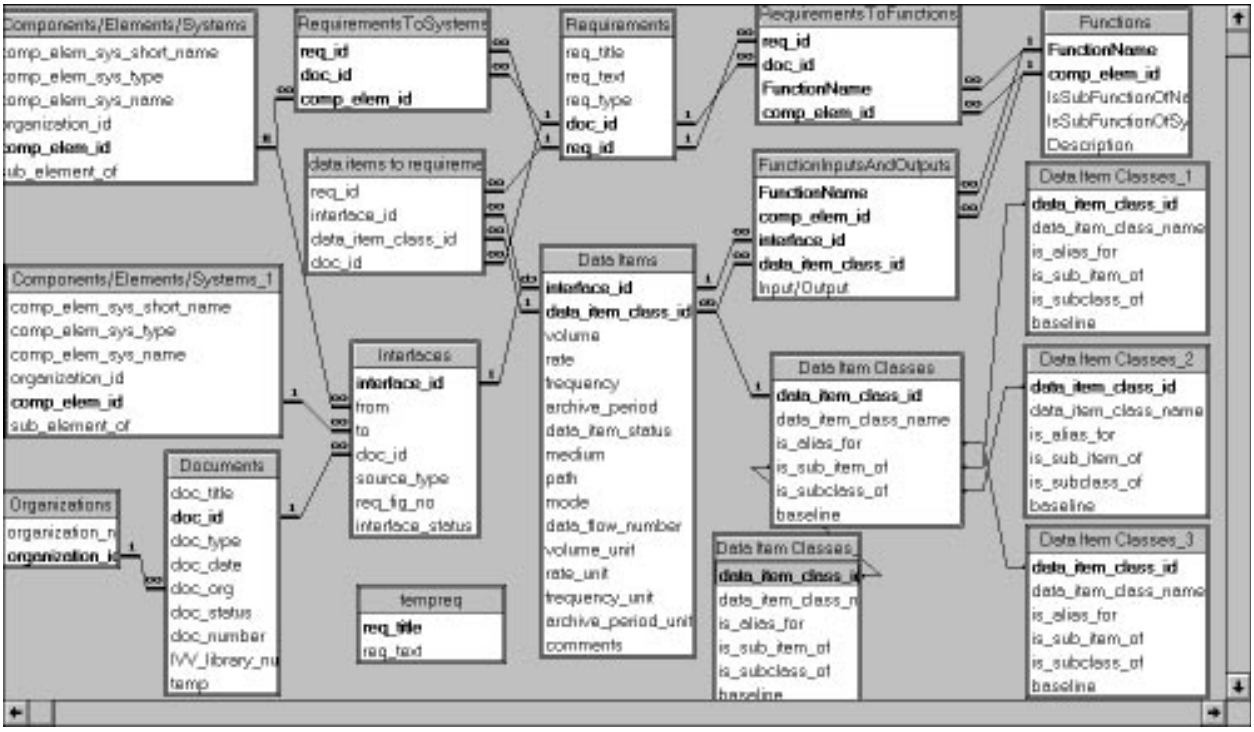

Exhibit 4.2.2-1 IADB Database Schema Design

The following subsections detail the database schema design for the IADB.

4.2.2.1. IADB Components/Elements/Systems Table

This table contains the names of the components, elements and systems that constitute the “from” and “to” entities of the interfaces. It also contains the relationships representing hierarchical nesting of components, elements and systems within one another.

Field Name	Data Type	Description
comp_elem_sys_short_name	Text	Acronym or abbreviated name for the component, element or system
comp_elem_sys_type	Text	Component, element, or system
comp_elem_sys_name	Text	Full name (i.e., no acronyms) for component, element or system
organization_id	Number	ID of responsible organization (foreign key from organizations table)
comp_elem_id	Counter	Unique id for each component/element/system (assigned by application)
sub_element_of	Number	Relationship of the component/element/system to another component/element/system to which the former is subordinate

Table 4.2.2-1 IADB Components/Elements/Systems Table

4.2.2.2. IADB Data Item Classes Table

The Data Item Classes table is the IADB's data dictionary. It contains every unique data item name, as well as alias, sub-item (i.e., logical containment) and subclass (i.e., specialization) relationships between the names. The purpose of the table is to support the reconciliation of apparent conflicts between or within documents with respect to the names of the data items flowing across a given interface.

Field Name	Data Type	Description
data_item_class_id	Counter	Unique id for each data item class
data_item_class_name	Text	Unique name for each data item class.
is_alias_for	Number	Link to data item class name
is_sub_item_of	Number	Link to data item class name
is_subclass_of	Number	Link to data item class name
baseline	Text	Specifies whether class is baselined.

Table 4.2.2-2 IADB Data Item Classes Table

4.2.2.3. IADB Data Items Table

This table contains one record for every data item flowing across every interface according to every source document. It also contains the detailed specifications associated with the data flow, such as rate and frequency, as well as the units associated with each parameter.

Field Name	Data Type	Description
interface_id	Number	Link to an interface
data_item_class_id	Number	Link to a data item class
volume	Number	Volume of data in MBytes/day
rate	Number	Data transmission rate in Kbps/sec
frequency	Number	Transmission frequency in times/day
archive_period	Number	Archive or storage duration in days
data_item_status	Text	Baseline, In Baseline, Not In Baseline
medium	Text	transmission medium
path	Text	transmission path
mode	Text	transmission mode (normal or contingency)
data_flow_number	Text	Identifier for a data flow unique within a document or diagram
volume_unit	Text	Units for transmittal volume
rate_unit	Text	Units for transmittal rate
frequency_unit	Text	Units for transmittal frequency
archive_period_unit	Text	Units for period
comments	Memo	Analyst's comments

Table 4.2.2-3 IADB Data Items Table

4.2.2.4. IADB Data Items to Requirements Table

The Data Items to Requirements table maintains the many-to-many relationships that can exist between data item specifications and relevant requirements from the same source document.

Field Name	Data Type	Description
req_id	Number	Internally assigned unique identifier for each requirement (foreign key)
interface_id	Number	Internally assigned unique identifier for each interface (foreign key)
data_item_class_id	Number	Internally assigned unique identifier for each data item class (foreign key)
doc_id	Number	Internally assigned unique identifier for each document (foreign key)

Table 4.2.2-4 IADB Data Items to Requirements Table

4.2.2.5. IADB Documents Table

This table contains a definition of each source document whose contents are entered into the IADB, including such information as the document title, date, and reference number.

Field Name	Data Type	Description
doc_title	Text	Title of document
doc_id	Counter	Uniquely identifies each document with a system-assigned integer.
doc_type	Text	Selected from a list of allowable document types. List is hard-entered.
doc_date	Date/Time	Publication date of the document. Combined with document title, uniquely identifies document as an alternative to document id.
doc_org	Number	ID number of responsible organization (Name is selected from list populated from Organizations table)
doc_status	Text	Indicates whether a document is part of the ESDIS project baseline set of interface specifications.
doc_number	Text	Alphanumeric identifier generally found on the document's cover
IVV_library_number	Text	IV&V contractor-assigned document identifier

Table 4.2.2-5 IADB Documents Table

4.2.2.6. IADB Function Inputs and Outputs Table

The Function Inputs and Outputs table maintains the many-to-many relationships between functions and input and output data flows associated with each function

Field Name	Data Type	Description
FunctionName	Text	Name of a function performed by a component/element/system
comp_elem_id	Number	Unique id for each component/element/system
interface_id	Number	Link to an interface
data_item_class_id	Number	Link to a data item class
Input/Output	Text	Input to or output from function

Table 4.2.2-6 IADB Function Inputs and Outputs Table

4.2.2.7. IADB Functions Table

This table maintains the names of the user-defined functions associated with each component, element or system. Each function is keyed by the combination of the name and component, element or system, so that the same function name can be associated with multiple components, elements or systems and have a unique identity for each.

Field Name	Data Type	Description
FunctionName	Text	Name of a function performed by a component/element/system
comp_elem_id	Number	Unique id for each component/element/system
IsSubFunctionOfName	Text	Name of a function of which it is a subfunction
IsSubFunctionOfSystem	Number	ID of a component/element/system of which it is a subfunction
Description	Memo	Description of function

Table 4.2.2-7 IADB Functions Table

4.2.2.8. IADB Interfaces Table

The Interfaces table maintains the list of from-to pairs associated with each document. Every interface in every document has a unique entry in the Interfaces table.

Field Name	Data Type	Description
interface_id	Counter	System-assigned unique identifier for each interface, i.e., directional pair of source and destination.
from	Number	Short name (usually acronym) of the component/element/system from which the data flows.
to	Number	Short name (usually acronym) of the component/element/system to which the data flows.
doc_id	Number	Link to source document in Documents table.
source_type	Text	Requirement, diagram or chart.
req_fig_no	Text	Identifier internal to document that uniquely identifies requirement, diagram or chart.
interface_status	Text	Baseline, Consistent, Inconsistent

Table 4.2.2-8 IADB Interfaces Table

4.2.2.9. IADB Organizations Table

The Organizations table contains the names of the organizations responsible for managing each source document.

Field Name	Data Type	Description
organization_name	Text	Name of any organization responsible for any relevant components, elements, external systems, or applicable documentation.
organization_id	Counter	Unique id for each organization

Table 4.2.2-9 IADB Organizations Table

4.2.2.10. IADB Requirements Table

This table contains the titles, text and requirement type (functional, performance, interface, operational) of requirements imported from source documents for the purpose of relating the requirements to systems, functions and data item specifications.

Field Name	Data Type	Description
req_title	Text	Programmatic title of requirement (e.g., "EOSD-0110")
req_text	Memo	Requirement Text
req_type	Text	Functional, performance, interface, operational
doc_id	Number	Document ID
req_id	Counter	Internally assigned requirement ID

Table 4.2.2-10 IADB Requirements Table

4.2.2.11. IADB Requirements To Functions Table

This table manages the many-to-many relationships that can exist between requirements and user-defined functions.

Field Name	Data Type	Description
req_id	Number	Requirement ID
doc_id	Number	Document ID
FunctionName	Text	Name of a function performed by a component/element/system
comp_elem_id	Number	Unique id for each component/element/system

Table 4.2.2-11 IADB Requirements To Functions Table

4.2.2.12. IADB Requirements to Systems Table

This table manages the many-to-many relationships that can exist between requirements and components, elements and systems.

Field Name	Data Type	Description
req_id	Number	Requirement ID
doc_id	Number	Document ID
comp_elem_id	Number	Unique id for each component/element/system

Table 4.2.2-12 IADB Requirements to Systems Table

4.2.2.13. IADB Tempreq Table

This table is used to temporarily hold imported requirements so that they can be cut and pasted into the requirements table.

Field Name	Data Type	Description
req_title	Text	Programmatic title of requirement (e.g., "EOSD-0110")
req_text	Memo	Requirement text

Table 4.2.2-13 IADB Tempreq Table

4.3. Test Management Database (TMDB) Design

TBD

4.4. EOSDIS IV&V Homepage Design

The EOSDIS IV&V Homepage is designed to support information dissemination for the Independent Verification and Validation work during the development of the EOS Ground System (EOS GS). The purpose of this tool is to provide an easily accessible storehouse of documentation and reports generated during the course of this project. This tool is also intended to be extensible so that information dissemination can encompass all areas of the project over its lifetime. This tool has an accompanying maintenance tool that facilitates timely update of information available through the homepage. Note that prototype screens exhibited in this document were captured in the Mosaic WWW browser; one of many browsers available. The menu's and buttons at the tops and bottoms of these screens are specific to the Mosaic browser and do not receive attention in this document.

4.4.1. EOSDIS IV&V Homepage GUI Design

The EOSDIS IV&V Homepage screen provides the first level of information about the EOSDIS IV&V Program and a high level overview of the contents and organization of the homepage. Additionally, the EOSDIS IV&V Homepage screen provides hotlinks to other homepages administered as a part of the EOSDIS IV&V Homepage including the EOSDIS IV&V Library, the Contacts List, and the Interface Analysis Data Base (IADB) Homepage, and hotlinks to homepages administered by other organizations working on related projects. There is also a small section that highlights upcoming features of the homepage.

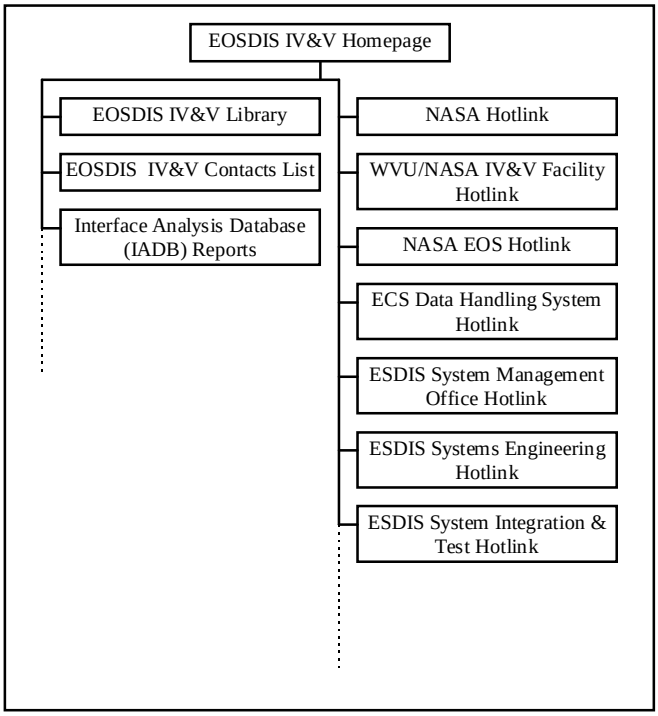

Exhibit 4.4.1-1 EOSDIS IV&V Homepage Menu/Screen Hierarchy

The following subsections detail the user interface design for the EOSDIS IV&V Homepage.

4.4.1.1. EOSDIS IV&V Homepage Screen

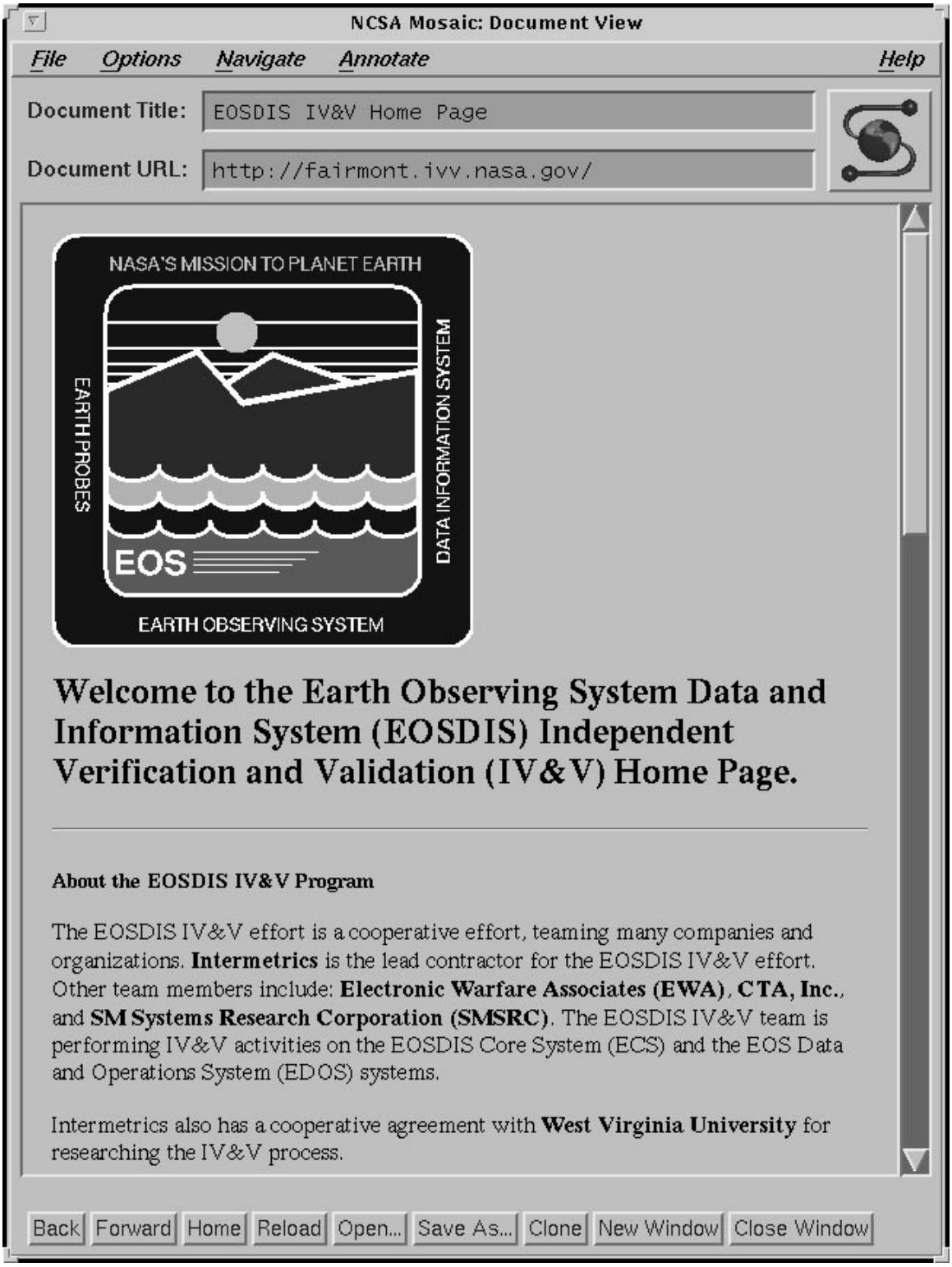

Exhibit 4.4.1-2a EOSDIS IV&V Homepage Introduction and Program Overview

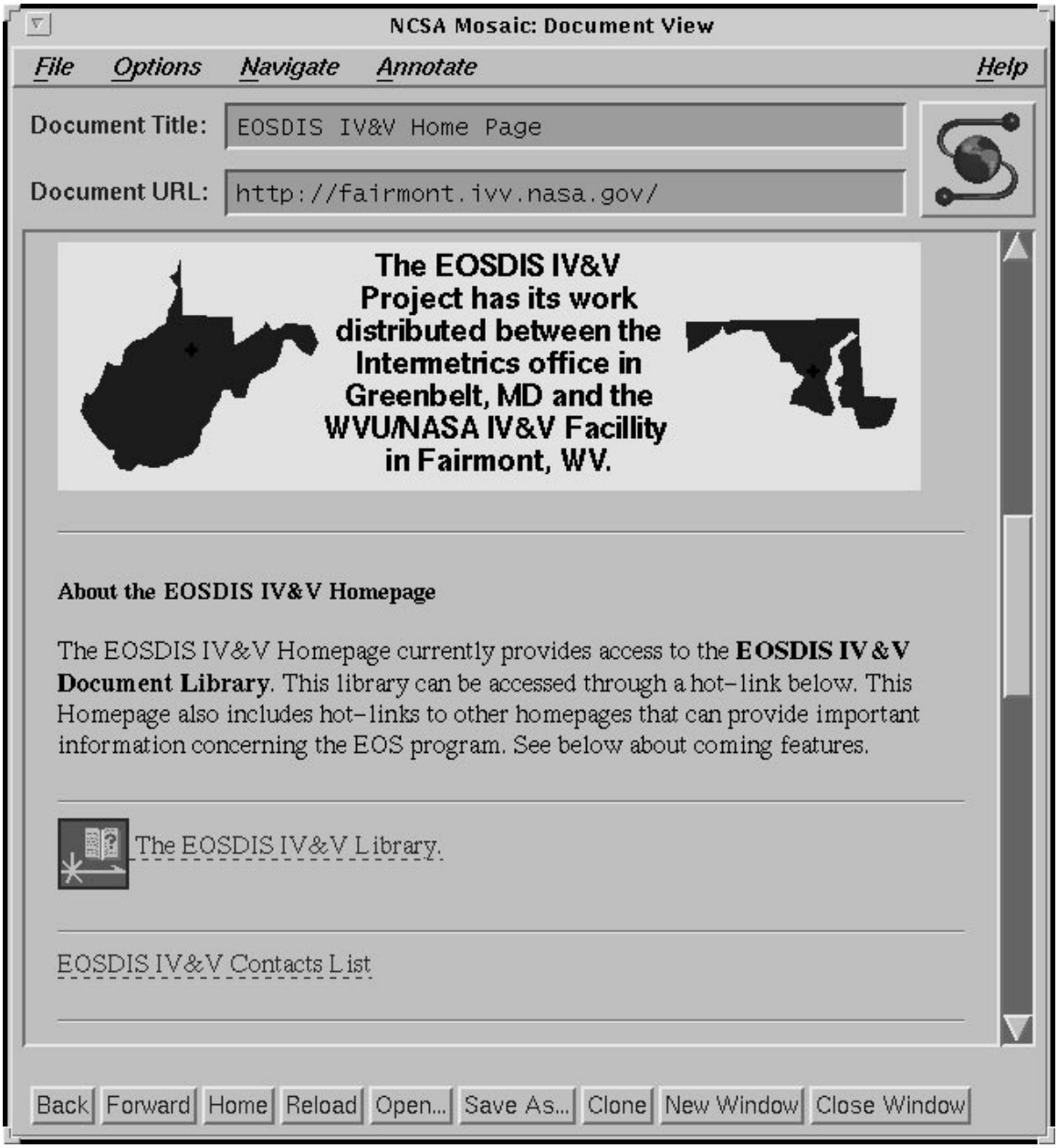

Exhibit 4.4.1-2b EOSDIS IV&V Homepage Library and Contacts List

Exhibit 4.4.1-2c EOSDIS IV&V Homepage Hotlinks

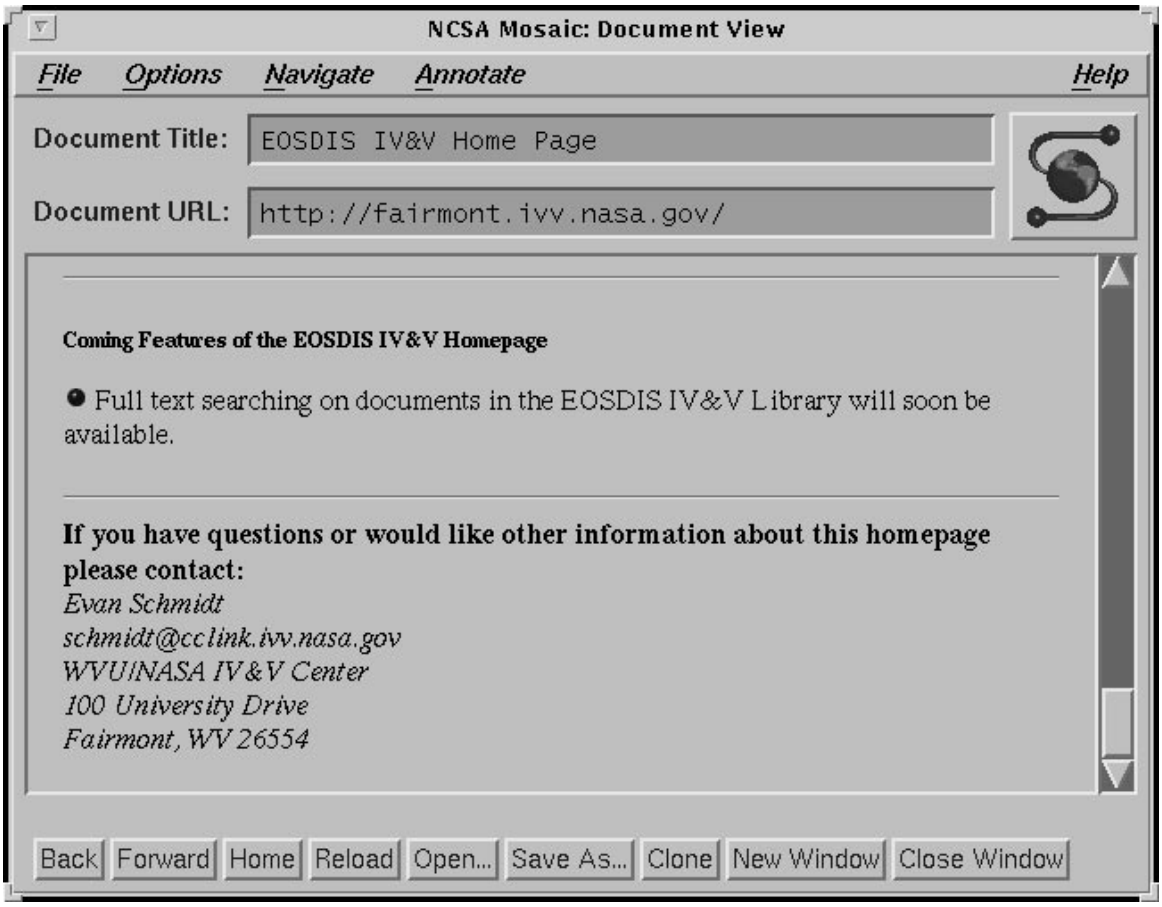

Exhibit 4.4.1-2d EOSDIS IV&V Homepage Status and Administrator Contact

4.4.1.2. EOSDIS IV&V Library Homepage

The EOSDIS IV&V Library Homepage is designed to present documents developed as part of the EOSDIS IV&V Program for browsing and downloading. This homepage is divided into two main sections that comprise the three steps for its usage. The first section (see Exhibit 4.4.1-3a) involves the step of submitting a category as the document catalog that will be used for choosing a specific document in the later steps. Documents are catalogued in five non mutually exclusive categories including All documents, Planning Documents, Status documents, Tools and Infrastructure documents, and Analysis documents. Multiple categories can be selected to generate a new document catalogue. Once the checkboxes for the desired categories have been marked the **Submit Document Categories** button needs to be clicked so that the new document catalogue can be generated. There is also a link to another homepage that describes each of the document catalogue categories. Additionally, full text searching will be implemented for generating a document catalogue according to customized needs.

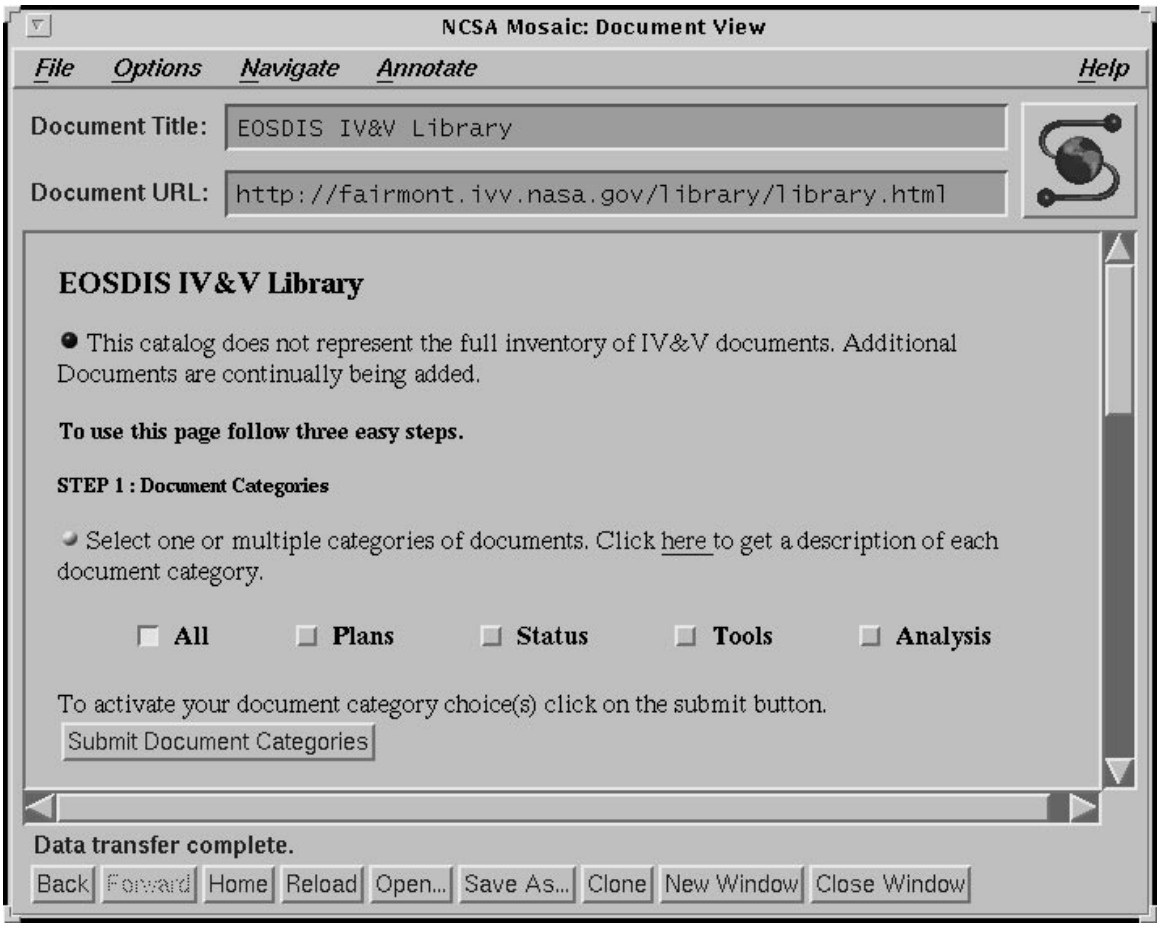

Exhibit 4.4.1-3a EOSDIS IV&V Library Homepage - Select Documents by Category

The second section of the EOSDIS IV&V Library Homepage (see Exhibit 4.4.1-3b) requires two steps. The first step is completed by highlighting a single document from the scrollable document catalogue. Documents are listed in alphabetical order within the catalogue. Because some document titles can be very long they are truncated to the first 80 characters for display purposes.

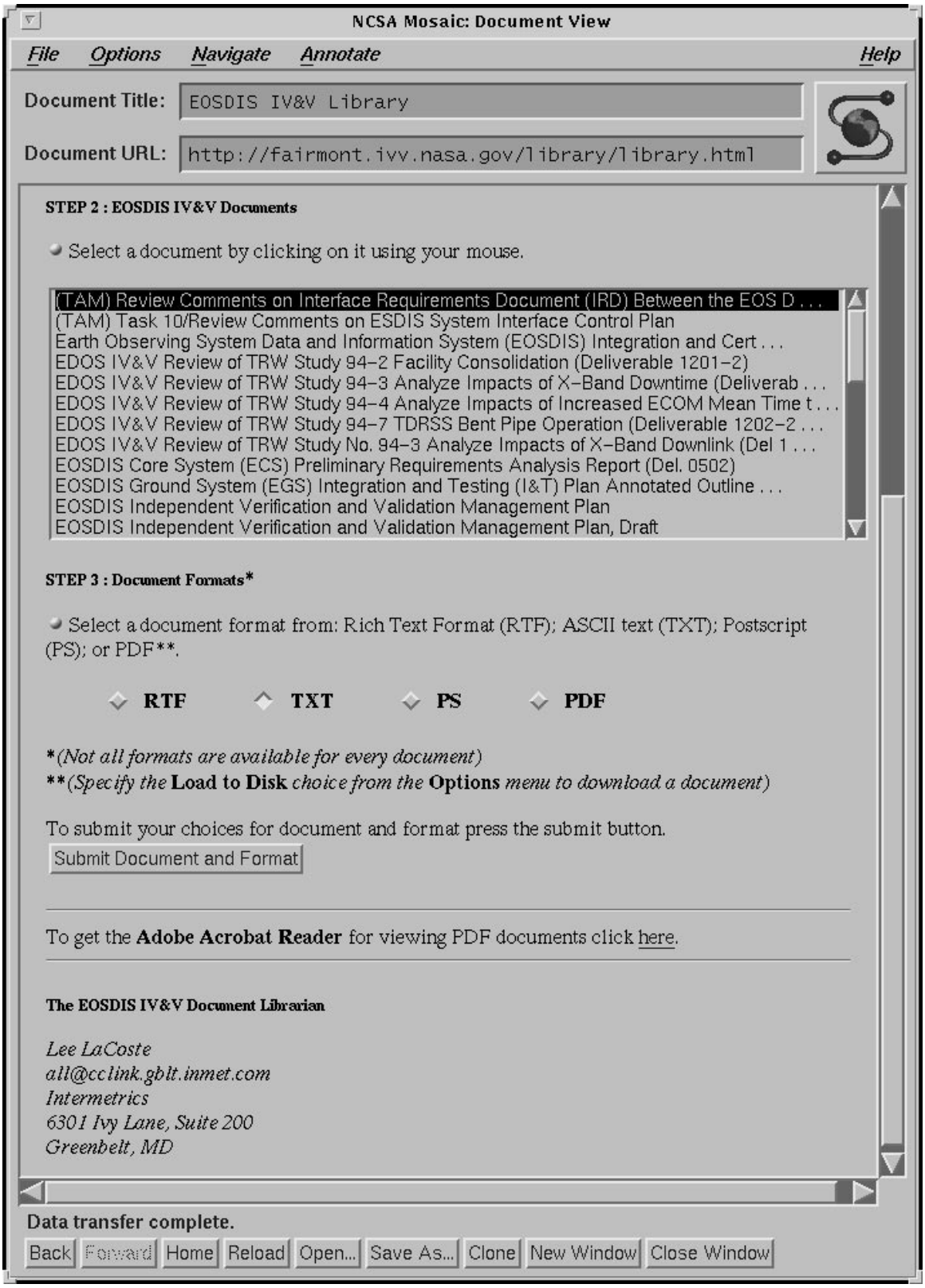

Exhibit 4.4.1-3b EOSDIS IV&V Library Homepage - Select Document and Format

Having selected a specific document the next step is to choose what format is preferred for the selected document. Choices for document format are pdf, ps, rtf, and txt. Once a document and a format have been selected the **Submit Document and Format** button must be clicked in order for these choices to be processed. The default action of WWW browsers is to present a document for viewing within the browser. In order to download a document the particular method for each browser is different. A short information messages advises users of this fact before they submit their choices. There are two additional pieces of information available on the EOSDIS IV&V Library Homepage. A hotlink to a homepage about getting the Adobe Acrobat Reader, shareware available for viewing pdf formatted documents. The second piece of information is the contact information for the EOSDIS IV&V Librarian.

Fields: None
Menu Items: None
Local Hotlinks:
1. Document Categories Descriptions.
This hotlink appears as underlined colored text “here” in the Library homepage in the sentence, “Click here to get description of each document category.” Clicking on this hotlink displays another homepage with descriptions of the document categories.
2. Adobe Acrobat Reader
This hotlink appears as underlined colored text “here” in the Library homepage in the sentence, “To get the Adobe Acrobat Reader for viewing PDF formatted documents click here.” Clicking on this hotlink displays another homepage with information about obtaining and installing the Adobe Acrobat Reader.
Buttons:
1. Category checkboxes: All, Plans, Status, Tools, Analysis
These checkboxes can be selected in any combination to specify from which categories a document catalogue should be generated. These buttons also reflect the categories comprising the listing in the currently displayed catalogue.
2. Submit Document Categories
This button is used to submit the document categories selected for defining the contents of the document catalogue presented on the Library homepage.
3. Document Catalogue (Scrollable selection list):
This is a list of documents from which a single one may be highlighted at a time. Used to specify which document will be viewed or downloaded. The first document in the catalogue listing is the default selection.
4. Format radio buttons:
These radio buttons allow a single format to be selected for viewing or downloading a document. The txt format is the default format selected.
5. Submit Document and Format
This button is used to submit the document and document format selected for viewing or downloading.

4.4.1.3. EOSDIS IV&V Contacts List Homepage

The Contact List Homepage presents a task by task listing of personnel working on the EOSDIS IV&V program. Task leaders are marked with an asterisk and appear first in the task listing. Each task is numbered and titled. Personnel information maintained is name, company affiliation, and electronic mail address. Additionally there are telephone numbers for contacting personnel at the Fairmont, WV or Greenbelt, MD offices where EOSDIS IV&V work is being conducted.

Exhibit 4.4.1-4 EOSDIS IV&V Contact List Homepage

4.4.2. Data/File Structure Design

The directory structure consists of a root level directory that the Hyper Text Transport Protocol (HTTP) server uses as the entry point for all homepage document requests. Currently the root directory, ROOTDIR in Exhibit 4.4.2-1, is /usr/local/etc/cern/WWW/htdocs. Under the root directory is a sub-directory for each subordinate homepage of the main EOSDIS IV&V Homepage, i.e. *contacts* for the contact list, *iadb* for the Interface Analysis Data Base homepage, and *library* for the EOSDIS IV&V Library homepage. Additionally, there is a directory, *maintenance*, for the Maintenance homepage and, *cgi-bin*, for Common Gateway Interface (CGI) scripts. Within each directory for a subordinate homepage resides at least the file that is that homepage and a *tmp* directory retaining any additional support files containing Hyper Text Markup Language (HTML) format that include error messages and building block files for dynamic regeneration of major homepage files.

The *library* subdirectory also contains a *documents* directory under which there is a separate directory holding the actual documents populating the library in the specific formats available. Currently our design supports four formats: Portable Document Format (PDF); Postscript (PS); Rich Text Format (RTF); and ASCII Text (TXT). These four formats were chosen for their wide usage and to provide as large a compatibility range as possible for potential users of the EOSDIS IV&V Homepage.

The *maintenance* subdirectory contains the typical *tmp* directory and a directory for maintenance files for each of the subordinate homepages. These directories hold all the html files that represent different screens of the Maintenance homepage. These files will be described in greater detail in a later section of this document.

The *cgi-bin* directory contains a subdirectory for each of the subordinate homepages, the Maintenance homepage, and a *general* directory for commonly used support scripts.Support scripts are written in the bourne shell programming language; a shell language common to Unix operating systems.

The directory structure is designed to support the addition of new subordinate homepages by creating a few new directories in the appropriate places and placing any main and support files within them. Additionally, the directory structure allows for the easy extension to support more document formats and the addition of maintenance screens in the event that additional informational areas are added to the EOSDIS IV&V Homepage.

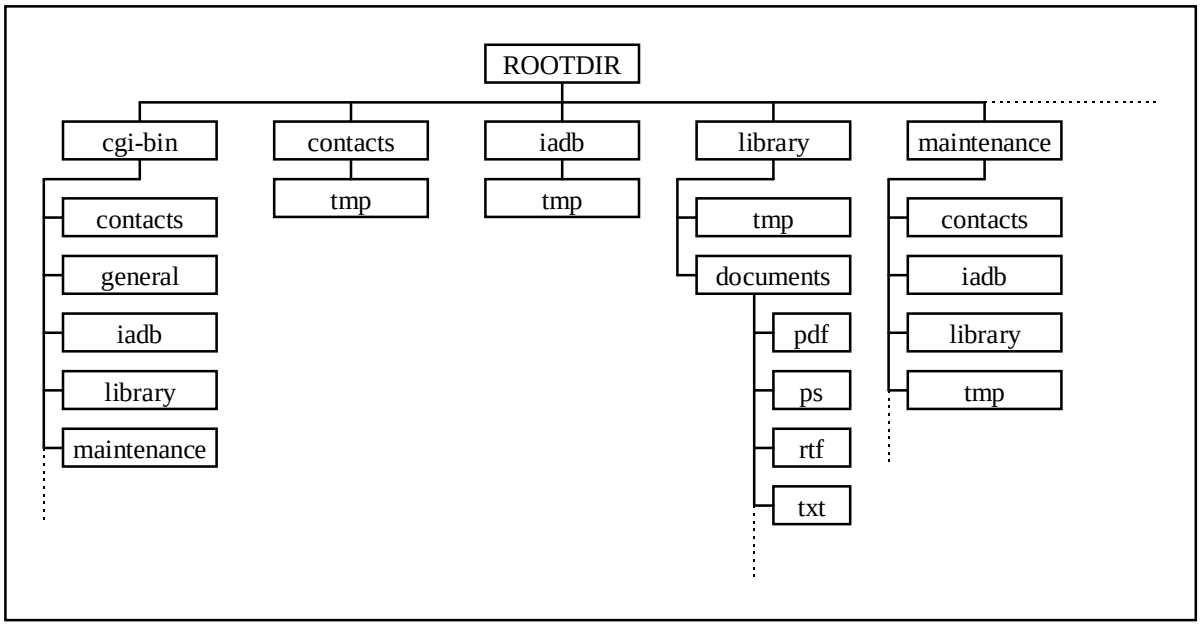

Exhibit 4.4.2-1 EOSDIS IV&V Homepage Directory Structure

The following sub-sections describe the important files used for the EOSDIS IV&V Homepage, the Library Homepage, and the Contacts List Homepage.

4.4.2.1. index.html

The file index.html resides in the root directory of the homepage directory tree. This file presents the opening screen of the EOSDIS IV&V Homepage. The purpose of index.html is to present an initial view of the EOSDIS IV&V effort and the organization of the EOSDIS IV&V Homepage.

4.4.2.2. library.html

The file library.html resides in the /ROOTDIR/library directory. This file presents the initial screen of the EOSDIS IV&V Homepage Library. The purpose of this screen is to provide the user with all the necessary information for utilizing the Homepage Library including sections for document catalogue selection by category; selection of an individual document by title; selection of document format; and submission of a particular document for downloading or on screen viewing.

4.4.2.3. documents

the directory documents resides in the /ROOTDIR/library directory. This directory contains the *document.index* file and subdirectories for each document format supported which includes *pdf*, *ps*, *rtf*, and *txt*.

4.4.2.4. document.index

The file document.index resides in the /ROOTDIR/library/documents directory. This file contains a list of every document in the EOSDIS IV&V Homepage Library. This file is consulted for any operation affecting the library homepage including maintenance operations and normal library requests. The information contained in this file includes the document identifier, the catalogue categories a document falls under, and a document title.

4.4.2.5. contacts.html

The file contacts.html resides in the contacts subdirectory of the root directory. This file presents a task by task listing of all personnel working on the EOSDIS IV&V effort. Information about personnel includes name, company, and electronic mail address. Additionally, there will be telephone numbers for the two offices where the personnel work and task leads are identified.

4.4.2.6. contacts.index

The file contacts.index resides in the /ROOTDIR/contacts/tmp directory. This file contains a list of personnel working on the EOSDIS IV&V project. This file will be consulted for any operation affecting the contact list homepage including maintenance operations and normal viewing. The information contained in this file includes first and last name, company name, and electronic mail address.

4.4.2.7. task.index

The file task.index resides in the /ROOTDIR/contacts/tmp directory. This file contains a list of all the tasks currently active for the EOSDIS IV&V project. This file is consulted for any operation affecting the contact list homepage including maintenance operations and normal viewing. The information contained in this file is each task's number and description.

4.4.3. Maintenance Tool

The purpose of the Maintenance tool is to provide the capability for non-developers to maintain the information content of all sections of the EOSDIS IV&V Homepage. As new sections are added to the EOSDIS IV&V Homepage a corresponding set of maintenance screens will also be developed. The lifetime of the EOSDIS IV&V effort is expected to run 10 years thus it is important that maintenance of the information content of the homepage can be done with a as little trouble as possible. The Maintenance homepage will be password protected to ensure that only relevant personnel can access it.

The Maintenance homepage will be divided in accordance with the subordinate homepages available through the EOSDIS IV&V Homepage. As it is currently envisioned there will be a section for the library homepage, the contact list homepage, and for the IADB homepage. Each of these sections will provide at a minimum the ability to add, update, and delete information relevant to that homepage. An instructions screen for the maintenance screens will also be available and reachable from each of them.

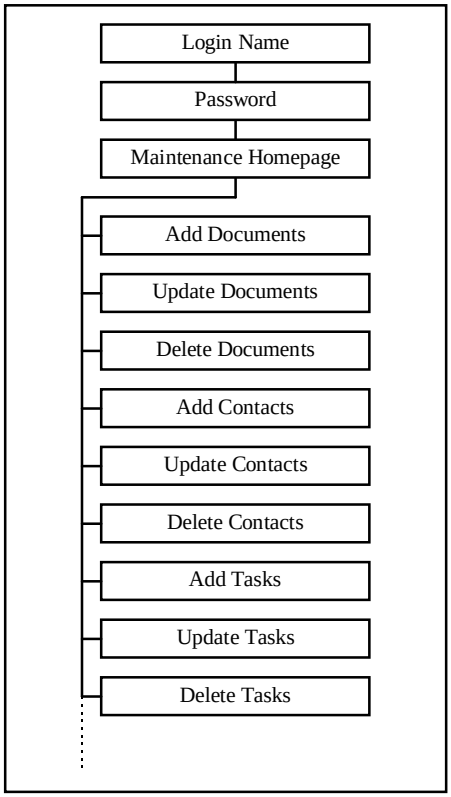

Exhibit 4.4.3-1 EOSDIS IV&V Maintenance Homepage Menu Hierarchy

Exhibit 4.4.3-2 EOSDIS IV&V Maintenance Homepage Opening Screen

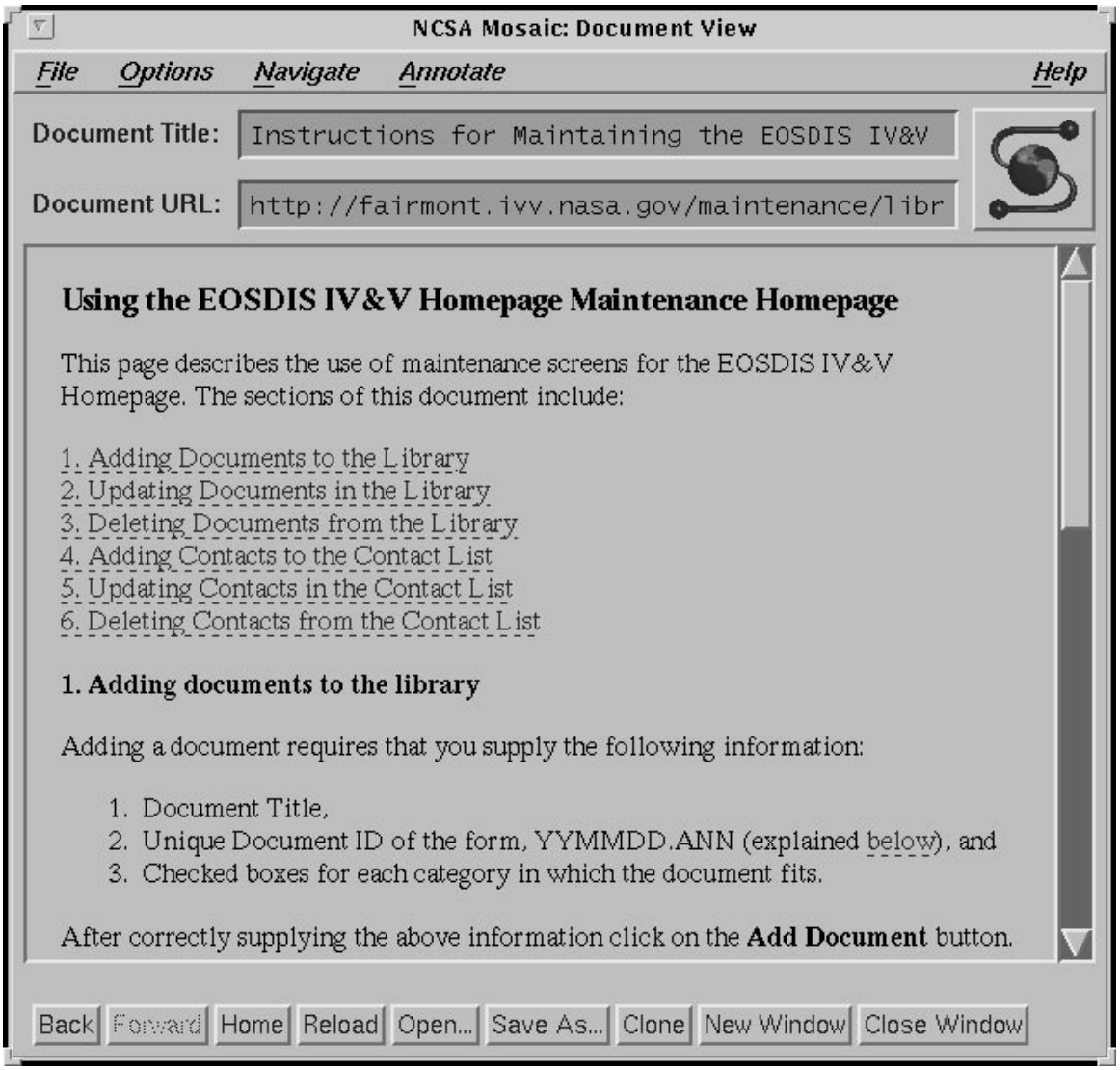

Exhibit 4.4.3-3 EOSDIS IV&V Maintenance Homepage Instructions

The instructions screen will have a table of contents with each maintenance item for which instructions exist listed. Items in the table of contents are hotlinks to the section of the document the entry describes.

Fields: None
Menu Items: None
Local Hotlinks:
1. Adding Documents to the Library
This hotlink moves to the Adding Documents section of the instructions.
2. Updating Documents in the Library
This hotlink moves to the Updating Documents section of the instructions.
3. Deleting Documents from the Library
This hotlink moves to the Deleting Documents section of the instructions.

4. Adding Contacts to the Contact List
This hotlink moves to the Adding Contacts section of the instructions.
5. Updating Contacts on the Contact List
This hotlink moves to the Updating Contacts section of the instructions.
6. Deleting Contacts from the Contact List
This hotlink moves to the Deleting Contacts section of the instructions.
Buttons: None

4.4.3.1. Add Documents

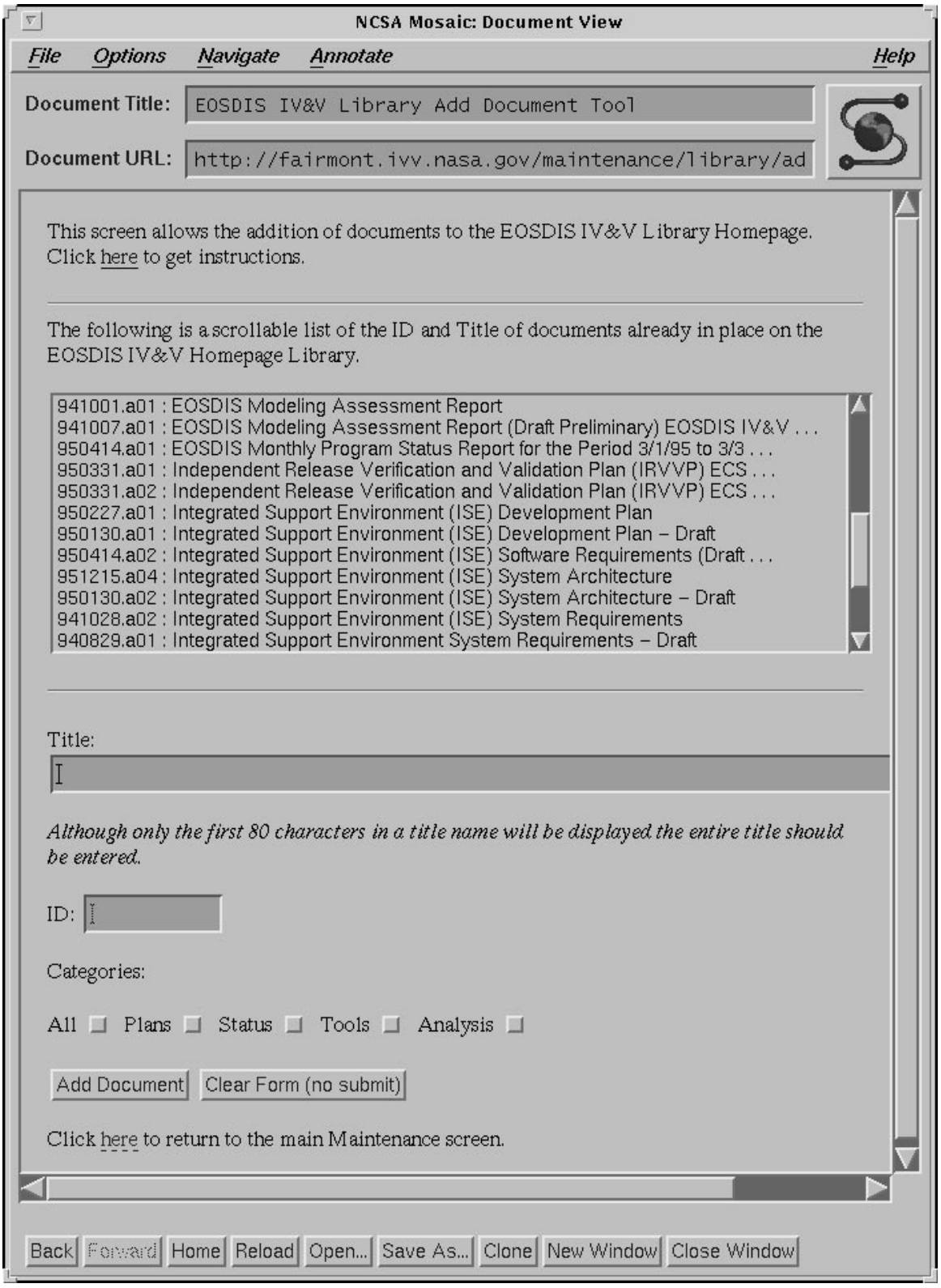

Exhibit 4.4.3-4 EOSDIS IV&V Maintenance/Add Documents Homepage

The Add Documents homepage of the Maintenance homepage allows the addition of documents to the EOSDIS IV&V Library homepage. The homepage has a hotlink to instructions on using the Add Document homepage. The homepage also presents a list of all documents currently in the Library homepage displaying both the document identifier and the first 80- characters of the document title. The bottom half of the homepage has two fields for entering the new documents title and a unique identifier, checkboxes for specifying in which categories the new document fits, and two buttons, one to add the document to the library and one for clearing the information currently entered in the fields and checkboxes. The last item on the Add Document homepage is a hotlink for returning to the main Maintenance homepage. Once a new document has been submitted for addition to the EOSDIS IV&V Library homepage error checking is conducted to ensure that a title, identifier, and categories have been entered and chosen that the identifier is unique, that documents exist in the transfer directories for the specified document (this is done by document identifier) and that documents in pdf, ps, and rtf formats have the appropriate headers. If any of these errors are encountered the addition of the new document is not performed. If the information entered for the new document is correct and complete and properly formatted documents do exist in the transfer directories then a confirmation screen is displayed before the actual addition is performed (see Exhibit 4.4.3-5).

FIELDS:
1. Title
This field is used to specify the title of a new document being placed in the EOSDIS IV&V Document Library homepage.
Field data type is string.
2. ID
This field is used to specify the document identifier of a new document being placed in the EOSDIS IV&V Document Library homepage.
Field data type is string.
MENU ITEMS: None
LOCAL HOTLINKS:
1. Instructions
This hotlink appears as underlined colored text , “here”, in the sentence, “Click here to get instructions.”
2. Return to main Maintenance Screen
This hotlink appears as underlined colored text “here” in the sentence, “Click here to return to the main Maintenance screen.” Clicking on this hotlink displays the main Maintenance screen of the Maintenance homepage.
BUTTONS:
1. Categories Checkboxes: All, Plans, Status, Tools, Analysis
The categories checkboxes are used to specify which categories a new document fits into. These checkboxes can be checked in any combination.
2. Add Document
This button is used to submit the document for acceptance into the EOSDIS IV&V Library Homepage.
3. Clear Form (no submit)

This button is used to clear information already entered into fields and uncheck checked checkboxes so that different information can be entered. There is no submission of information for addition into the EOSDIS IV&V Library.

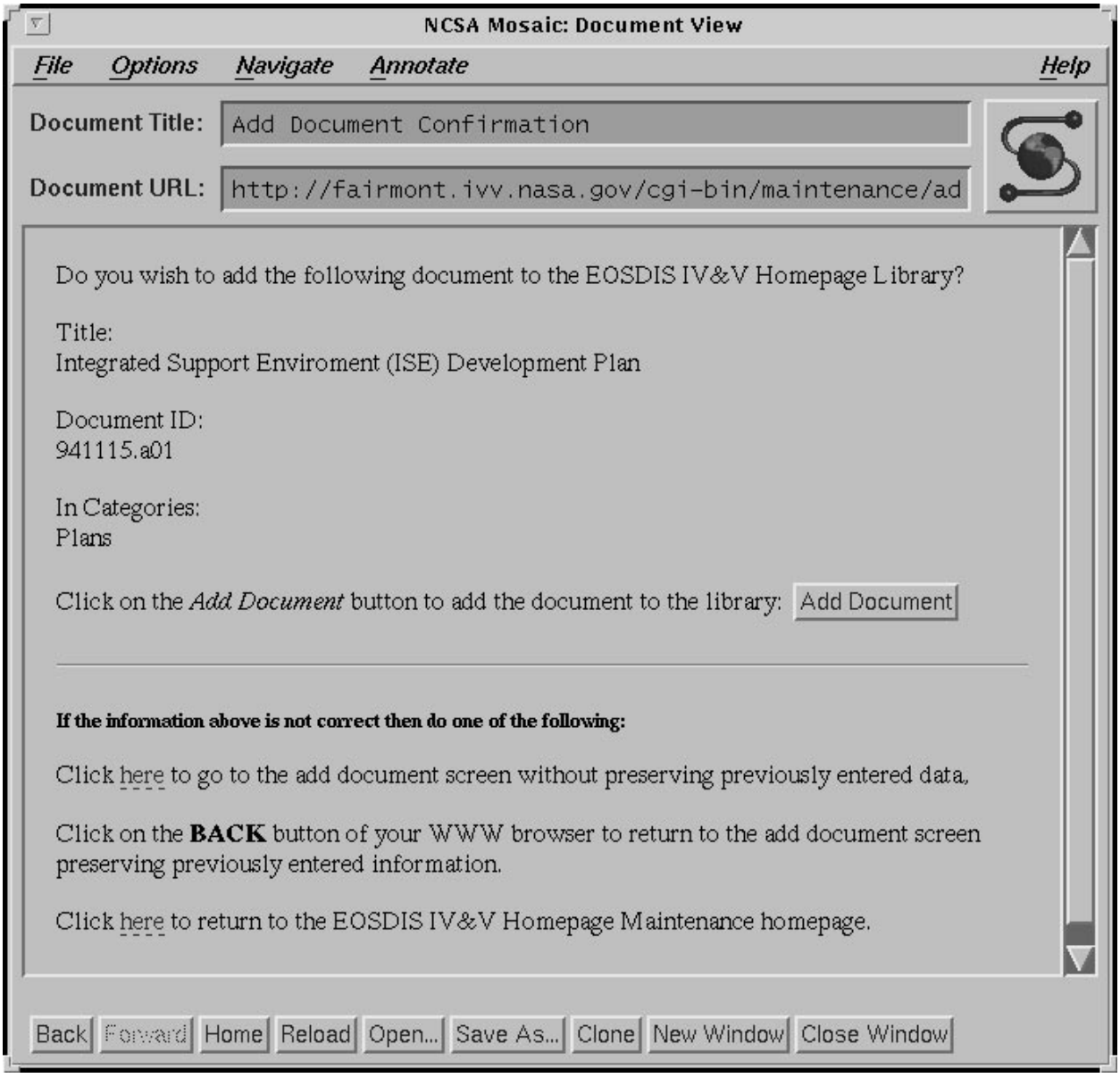

Exhibit 4.4.3-5 EOSDIS IV&V Maintenance/Add Documents Confirmation

The Add Document Confirmation screen displays the information entered in the add document screen and has a single button, **Add Document**, that can be clicked if the information is correct. If there is any reason at this point to not continue the add document operation hotlinks at the bottom of the screen allow return to the Add Document homepage or to the main Maintenance homepage.

FIELDS: None

MENU ITEMS: None
LOCAL HOTLINKS:
1. Return to Add Document homepage
This hotlink appears as underlined colored text “here” on the Add Document Confirmation homepage in the sentence, “Click here to return to the Add Document Homepage.” Click here to go to the add document maintenance screen without preserving previously entered data.
2. Return to main Maintenance homepage
This hotlink appears as underlined colored text “here” on the Add Document homepage in the sentence, “Click here to return to the main EOSDIS Homepage Maintenance homepage.” Clicking on this hotlink displays the main Maintenance screen of the Maintenance homepage.
BUTTONS:
1. Add Document
The Add Document button is used to finalize the addition of the new document to the EOSDIS IV&V Library homepage.

4.4.3.2. Update Documents

The Update Documents homepage is designed to allow correction of information entered about documents already residing in the EOSDIS IV&V Library homepage. This homepage has a scrollable listing of every document in the library listing both document identifier and title. A single document can be selected in this list and when the **Choose Document to Update** button is clicked the appropriate information is entered into the editing fields on the lower half of the homepage. It is not necessary to use the scrollable list and Choose Document to Update button. Instead entry of a valid identifier in the **ID** field provides enough information to perform an update to the correct document. Any field or checkbox left blank will result in that information about the document remaining unchanged. Clicking on the **Update Document** button will cause the update action to be performed. Clicking on the **Clear Form (no update)** will clear any entered data without causing an update. There is a hotlink for getting instructions and a hotlink for returning to the main Maintenance homepage.

Refer to Section 4.4.3.1 for a description of fields, buttons, and local hotlinks.

4.4.3.3. Delete Documents

The Delete Documents homepage is designed to allow the deletion of documents that already reside on the EOSDIS IV&V Library homepage. This operation is irreversible and for that reason another layer of password protection is employed to restrict use of this screen. Confirmation is also requested before the operation can be performed. This homepage presents a scrollable list of every document in the library listing both document identifier and title. A single document can be selected and then if the **Delete Document** button is clicked on a confirmation screen will ask if the selected document should indeed be deleted from the EOSDIS IV&V Library homepage. There is a hotlink for getting instructions and a hotlink for returning to the main Maintenance homepage.

Refer to Section 4.4.3.1 for a description of fields, buttons, and local hotlinks.

4.4.3.4. Add Contacts

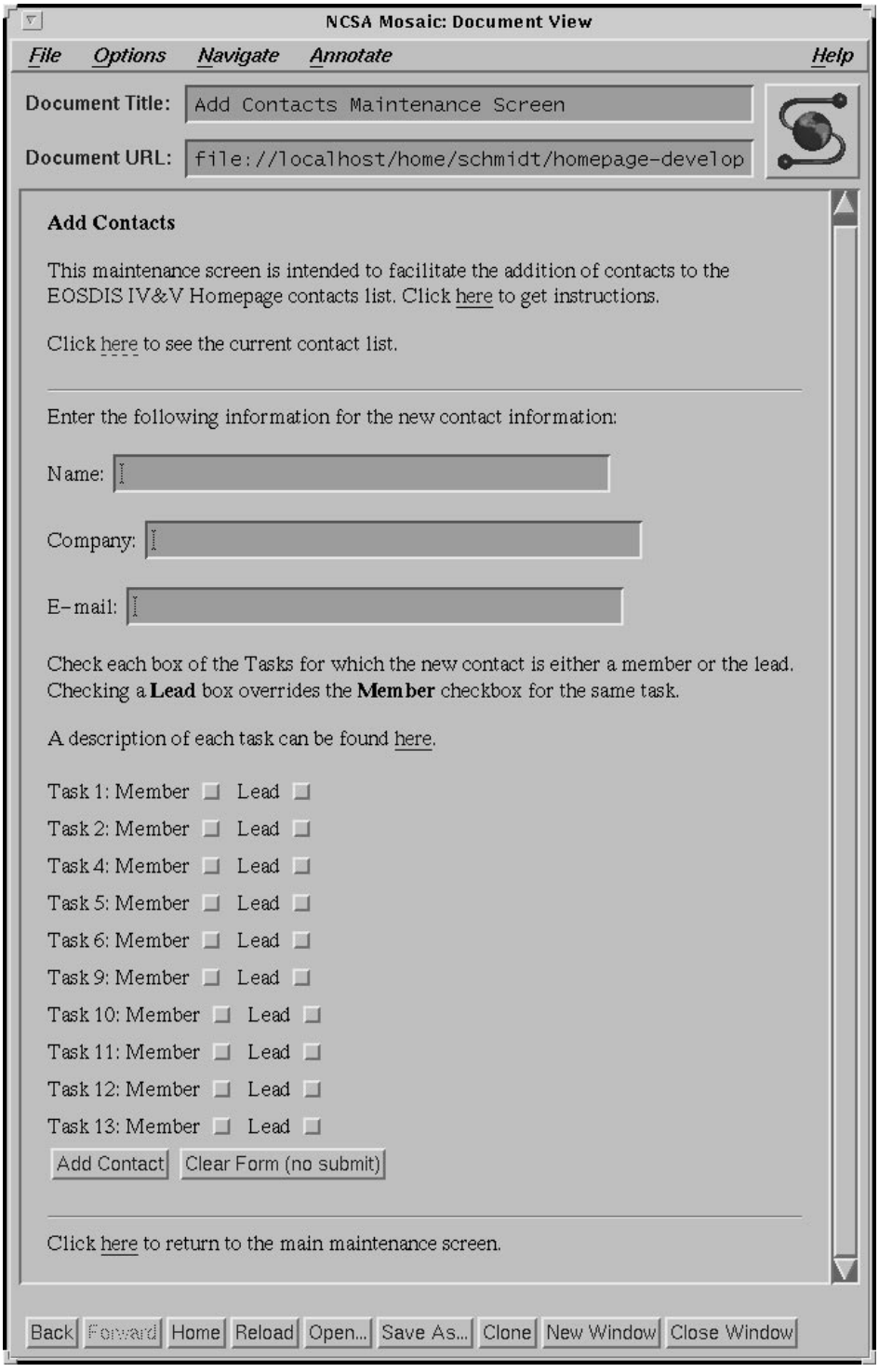

Exhibit 4.4.3-5 EOSDIS IV&V Maintenance/Add Contacts Homepage

The Add contacts Maintenance homepage is used for adding new contacts to the EOSDIS IV&V Contact List Homepage. There are three mandatory fields that must be filled as well as at least

one checkbox that must be checked in order to successfully add a new contact. The three fields are for the contact persons name, company affiliation, and electronic mail address. The checkboxes are for specifying on which tasks the contact works and whether or not the contact is a task lead or a task member. To add a new contact the **Add Contact** button must be clicked on. Upon clicking on the **Add Contact** button if any fields have been left blank or no checkboxes have been checked an error message is displayed. To clear information entered in fields and checked checkboxes the **Clear Form (no submit)** button is available. There are four hotlinks: one for instructions on using the Add Contacts homepage; one for viewing the current contact list; one for getting the names of each of the tasks; and one for returning to the main Maintenance homepage.

FIELDS:
1. Name
This field is used to enter the name of a new contact to be added to the EOSDIS IV&V Contact List. This field is mandatory.
The data type for this field is string.
2. Company
This field is used to specify the company affiliation of a new contact to be added to the EOSDIS IV&V Contact List. This field is mandatory.
The data type for this field is string.
3. E-mail
This field is used to specify the electronic mail address of a new contact to be added to the EOSDIS IV&V Contact List. This field is mandatory.
The data type for this field is string.
MENU ITEMS:
LOCAL HOTLINKS:
1. Instructions:
This hotlink appears as underlined colored text, “here”, in the sentence, “Click here to get instructions.”
2. Current Contact List
This hotlink appears as underlined colored text, “here”, in the sentence, “Click here to see the current Contact List.”
3. Task Names
This hotlink appears as underlined colored text, “here”, in the sentence, “Click here to see the names of each Task.”
4. Return to main Maintenance homepage
This hotlink appears as underlined colored text, “here”, in the sentence, “Click here to return to the main Maintenance homepage.”
BUTTONS:
Task Member and Lead Checkboxes:
1. Add Contact
This button is used to submit the contact information for acceptance into the EOSDIS IV&V Contact List Homepage.
2. Clear Form (no submit)

This button is used to clear information already entered into fields so that different information can be entered. There is no submission of information for addition into the contact list.

4.4.3.5. Update Contacts

The update Contacts homepage is designed to allow the correction of information about contacts already a part of the EOSDIS IV&V Contacts List homepage. This homepage presents a scrollable list of each contact person from which a single contact can be selected. Clicking on the **Choose Contact to Update** button fills in the editable fields and checks the appropriate checkboxes in the edit section of this homepage. It is not necessary to use the scrollable list and Choose Contact to Update button. Instead entry of a valid name in the **Name** field provides enough information to perform an update to the correct contact. Any field or checkbox left blank will result in that information about the contact remaining unchanged. Clicking on the **Update Contact** button will cause the update action to be performed. Clicking on the **Clear Form (no update)** will clear any entered data without causing an update. There is a hotlink for getting instructions and a hotlink for returning to the main Maintenance homepage.

Refer to Section 4.4.3.4 for a description of fields, buttons, and local hotlinks.

4.4.3.6. Delete Contacts

The Delete Documents homepage is designed to allow the deletion of documents that already reside on the EOSDIS IV&V Library homepage. This operation is irreversible and for that reason another layer of password protection is employed to restrict use of this screen. Confirmation is also requested before the operation can be performed. This homepage presents a scrollable list of every document in the library listing both document identifier and title. A single document can be selected and then if the **Delete Document** button is clicked on a confirmation screen will ask if the selected document should indeed be deleted from the EOSDIS IV&V Library homepage. There is a hotlink for getting instructions and a hotlink for returning to the main Maintenance homepage.

Refer to Section 4.4.3.4 for a description of fields, buttons, and local hotlinks.

4.4.3.7. Add Tasks

TBD

4.4.3.8. Update Tasks

TBD

4.4.3.9. Delete Tasks

TBD

4.4.4. Maintenance Homepage Directories and Files

Refer to Exhibit 4.4.2-1 for a pictorial description of how and where the maintenance homepage fits in with the overall organization of the EOSDIS IV&V homepage hierarchy. The following sections provide a description of the directories and file relevant to the Maintenance Homepage.

4.4.4.1. maint.html

The file maint.html resides in the /ROOTDIR/maintenance directory. This file presents a menu of maintenance operations that can be performed on the EOSDIS IV&V Homepage information sections. Add, update, and delete operations are envisioned for each item of significant information.

4.4.4.2. add_doc.html, update_doc.html, delete_doc.html

The files add_doc.html, update_doc.html, delete_doc.html reside in the /ROOTDIR/maintenance/library directory. These files are designed to present the information and data entry areas necessary for adding, deleting or updating documents or information about documents in the EOSDIS IV&V Library Homepage.

4.4.4.3. add_contact.html, update_contact.html, delete_contact.html

The files add_contacts.html, update_contacts.html, delete_contacts.html reside in the /ROOTDIR/maintenance/contacts directory. These files are designed to present the information and data entry areas necessary for adding, deleting or updating information about personnel working on the EOSDIS IV&V contract.

4.4.4.4. add_task.html, update_task.html, delete_task.html

The files add_tasks.html, update_tasks.html, delete_tasks.html reside in the /ROOTDIR/maintenance/contacts directory. These files are designed to present the information and data entry areas necessary for adding, deleting or updating tasks displayed on the contact list homepage.

5. EXTERNAL INTERFACE DESIGN

5.1. RTM/Oracle Data Interfaces

The Hughes EOSDIS Core System (ECS) requirements database is hosted in the Requirement Traceability Management (RTM) tool from Marconi Systems Technology. RTM utilizes Oracle as its primary repository for information. The ECS RTM/Oracle database is periodically exported by Hughes for import by the RTM tool within the ISE. The ISE RTM/Oracle database provides the primary information base for requirement traceability assessment and other IV&V activities. For specific details regarding the RTM database import interface, refer to the RTM product documentation set.

Exhibit 5-1 is a screen capture of the RTM class definition diagram. Each of the objects in the graphic represent a particular object class. The connecting lines represent the relationships between classes.

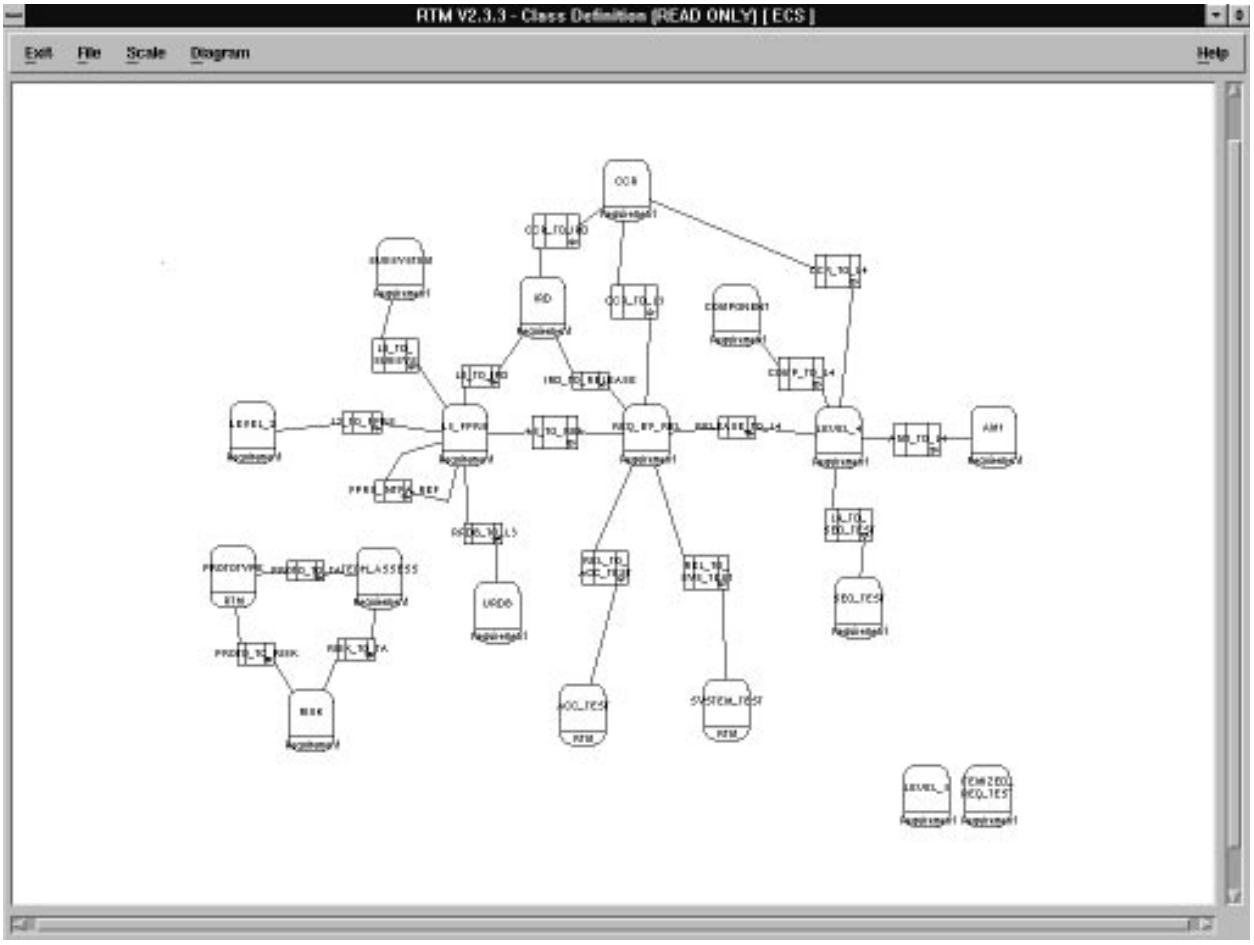

Exhibit 5.1-1 RTM ECS Class Definition Diagram

REQUIREMENT_ATTRIBUTES Table

The Requirement Attributes Table is the one table in RTM/Oracle that is accessed most frequently. This table contains an entry for each requirement. In order to reference a unique record within the database table, a key consisting of two fields is used. These fields are the REQUIREMENT_KEY field and the CLASS_ID field. Basically, all requirement entries in the database are stored in this table regardless of the requirement classes defined as a part of the project schema. For additional information regarding the RTM Requirement Attributes table, refer to the RTM documentation set.

FIELD NAME	DATA TYPE	SIZE	NULL
ACCESS_STATUS	VARCHAR2	1	NOT NULL
CLASS_ID	NUMBER	10	NOT NULL
CURRENT_STATUS	VARCHAR2	20	NOT NULL
CURRENT_USER	VARCHAR2	30	
CURRENT_DISPLAY	VARCHAR2	75	
DATE_ACCESSED	NUMBER	12	NOT NULL
DATE_CREATED	NUMBER	12	NOT NULL
DOCUMENT_ID	VARCHAR2	45	NOT NULL
ORIGINAL_EDITOR	VARCHAR2	30	NOT NULL
PARAGRAPH_ID	VARCHAR2	60	
REQUIREMENT_KEY	NUMBER	10	NOT NULL
REQUIREMENT_TEXT	LONG		NOT NULL
SOURCE_REQUIREMENT	VARCHAR2	1	NOT NULL
LINKABILITY	VARCHAR2	1	NOT NULL

Table 5.1-2 RTM REQUIREMENT_ATTRIBUTES Table

GENERIC_ATTRIBUTE_VALUES Table

The Generic Attribute Values Table contains keys necessary to access requirement attributes based upon an attribute ID. For additional information regarding the RTM Generic Attribute Values table, refer to the RTM documentation set.

FIELD NAME	DATA TYPE	SIZE	NULL
CLASS_ID	NUMBER	10	NOT NULL
RECORD_KEY	NUMBER	10	NOT NULL
ATTRIBUTE_ID	NUMBER	10	NOT NULL

VALUE	VARCHAR2	10	

Table 5.1-3 RTM GENERIC_ATTRIBUTE_VALUES Table

Data interfaces exist between tools being developed for incorporation in the ISE and the ECS requirements RTM/Oracle database. The following subparagraphs detail the external interfaces with the RTM/Oracle database by each ISE tool.

5.1.1. ARDB RTM/Oracle Interfaces

The ARDB interfaces with the RTM/Oracle database to obtain requirement information based upon requirement identifier, requirement class (e.g. IRD, Requirement by Release, etc.), and other fields maintained in the REQUIREMENT_ATTRIBUTES and GENERIC_ATTRIBUTE_VALUES RTM/Oracle tables.

5.1.1.1. REQUIREMENT_ATTRIBUTES Table Interface

Fields Accessed:

CLASS_ID

This field is part of a unique key for each of the records in the table. It contains a code value as outlined in the table below.

CLASS_ID	CLASS_TITLE
1	LEVEL_2
2	LEVEL_3
18	LEVEL_4
85	PROTOTYPE
90	IRD
98	URDB
102	TECH_ACCESS
103	RISK
119	SEG_TEST
123	L3_FPRS
134	ITEMIZED_REQ_TEST
143	SUBSYSTEM
154	REQ_BY_REL
167	SYSTEM_TEST
168	ACC_TEST
179	COMPONENT
183	CCR
193	AM1

PARAGRAPH_ID

This field contains the requirement identification string based on the paragraph heading of the original document. This is not a key value in the RTM/Oracle tables but is displayed for the use of the analysts.

REQUIREMENT_KEY

This field is a unique key field (within class) generated by RTM when a requirement is first entered. The ARDB stores this value to maintain a link to the correct requirement.

REQUIREMENT_TEXT

This field contains the actual text of the requirement that is displayed by the ARDB.

CURRENT_STATUS

This field is used by RTM to store the status of the requirement. The possible states are ‘Current’, ‘Replaced’, ‘Substituted’, ‘Deleted’. RTM stores all versions of a requirement. The ARDB retrieves only requirements with a ‘Current’ value in this field.

5.1.1.2. GENERIC_ATTRIBUTE_VALUES Table Interface

Fields Accessed:

CLASS_ID

This field is used as part of a unique key for each requirement accessed by the ARDB.

RECORD_KEY

This field is used as part of the unique key for each requirement accessed by the ARDB

VALUE

This field contains user defined attributes. Values of: ‘A’, ‘B’, ‘C’, ‘D’, ‘IR1’ are accessed by the ARDB to select requirements for a particular release.

ATTRIBUTE_ID

This field contains a numerical value to key RTM generic, user defined attributes. The ARDB is accessing records with a value of ‘376’. This corresponds to an attribute of ‘Release’.

5.1.2. TMDB RTM/Oracle Interfaces

TBD

5.2. EOSDIS IV&V Homepage Interfaces

The EOSDIS IV&V Homepage interfaces encompass a set of hot links to homepages maintained by NASA and NASA contractors that hold information relevant to NASA programs in general and the EOS program in specific.

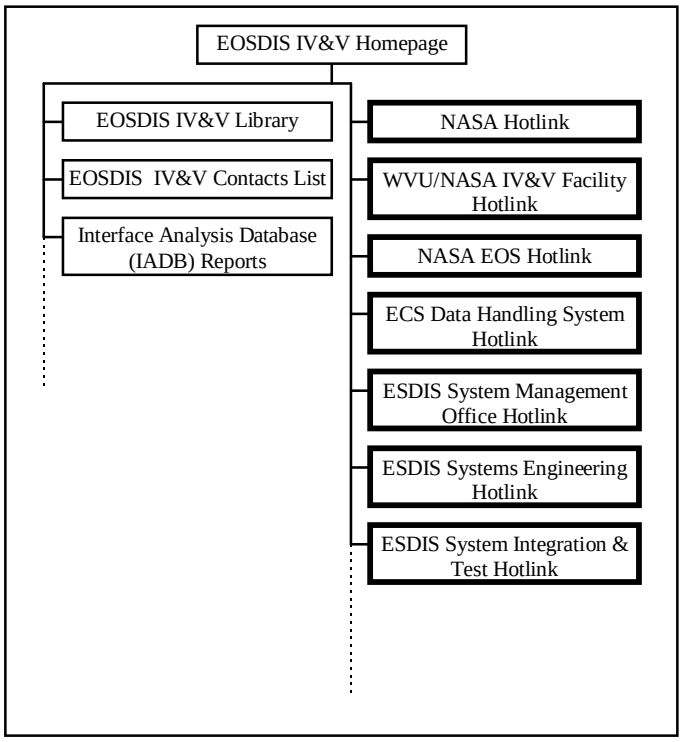

Exhibit 5.2-1 EOSDIS IV&V Homepage Hotlinks to External Interfaces

5.2.1. NASA Hotlink

The NASA Hotlink provides access to the Main NASA homepage being served from the Goddard Space Flight Center. This homepage has hotlinks to homepages related to the EOSDIS IV&V Program and all other NASA programs.

5.2.2. WVU/NASA IV&V Facility Hotlink

The WVU/NASA IV&V Facility hotlink provides access to the Fairmont, WV IV&V Facility where a substantial portion of the EOSDIS IV&V work is being conducted.

5.2.3. NASA EOS Hotlink

The NASA EOS Hotlink provides access to the main EOS Program homepage. This homepage provides hotlinks to the specific homepages relevant to the EOS program including EOSDIS IV&V.

5.2.4. ECS Data Handling System (EDHS) Hotlink

The ECS Data Handling System (EDHS) hotlink provides access to the HAIS homepage containing documentation relevant to the development of components of the EOS system.

5.2.5. ESDIS System Management Office (SMO) Hotlink

The ESDIS System Management Office hotlink provides access to the ESDIS homepage that provides an overview of the Engineering Science Data and Information System program activities.

5.2.6. ESDIS Systems Engineering Hotlink

The ESDIS System Engineering hotlink provides access to the ESDIS homepage that describes in detail the activities of the Systems Engineering tasks for EOSDIS.

5.2.7. ESDIS System Integration and Test Hotlink

The ESDIS System Integration and Test hotlink provides access to the ESDIS homepage that describes in detail the activities and steps of the System Integration and Test activities for the EOS Ground System (EGS).

6. ABBREVIATIONS AND ACRONYMS

Below is a list of the abbreviations and acronyms used in this document.

ARDB	-	Automated Requirements Database
BONeS	-	Block Oriented Network Simulator
CGI	-	Common Gateway Interface
COTS	-	Commercial Off-The-Shelf
DBI	-	Data Browser Interface
DID	-	Data Item Description
DMDB	-	Data Management Database
Ecom	-	EOS Communication System
ECS	-	EOSDIS Core System
EDHS	-	ECS Data Handling System
EDOS	-	EOS Data and Operations System
EGS	-	EOS Ground System
EOS	-	Earth Observing System
EOSDIS	-	Earth Observing System Data Information System
ESDIS	-	Earth Science Data and Information System
FTP	-	File Transfer Protocol
GS	-	Ground System
GUI	-	Graphic User Interface
HAIS	-	Hughes Automated Information Systems
HTML	-	Hyper Text Markup Language
HTTP	-	Hyper Text Transport Protocol
IADB	-	Interface Analysis Database
ICD	-	Interface Control Document
IDHS	-	Issue/Discrepancy Handling System
IIR	-	Integrated Information Repository
IRD	-	Interface Requirement Document
ISE	-	Integrated Support Environment
IV&V	-	Independent Verification and Validation
LAN	-	Local Area Network
M&O	-	Maintenance and Operations
N/A	-	Not Applicable
NASA	-	National Aeronautics And Space Administration
PAR	-	Performance Assurance Requirements
PDF	-	Portable Document Format
PS	-	Postscript
RAD	-	Rapid Application Development
RTF	-	Rich Text Format
RTM	-	Requirements Traceability Management
SMO	-	System Management Office
SOW	-	Statement Of Work
STD	-	Standard

TBD	-	To be determined
TBS	-	To be supplied
TMDB	-	Test Management Database
TXT	-	ASCII Text
V&V	-	Verification and Validation
WAN	-	Wide Area Network
WWW	-	World Wide Web

7. GLOSSARY

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8. NOTES

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9. APPENDICES

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